The Research Quarterly

of the

American Association for Health, Physical Education, and Recreation

ELMER D. MITCHELL, Ph.D., *Editor*

VOL. XI **MAY, 1940** **No. 2**

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Published in March, May, October, and December by the American Association for Health, Physical Education, and Recreation, 1201 Sixteenth Street, N.W., Washington, D.C. Subscription, $3.00 per year; single copies, $1.00.

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Editorial and Advertising Office: 311 Maynard Street, Ann Arbor, Michigan. Advertising rates on application.

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The Present Status of Physical Indices

By Elizabeth Powell
Department of Hygiene and Physical Education
Wellesley College

BY DEFINITION an index differs from a simple measurement in that the idea of comparison is introduced in addition to the idea of quantity. In one type of index both the numerator and the denominator of a ratio are measured, and the index measures changes in proportion rather than changes in the original factors. An index may also be thought of as a sample of a quantity which is difficult or impossible to measure directly. Since the denominator in this type of index is unmeasured or unmeasurable, the numerator itself becomes the index—the quantity not equivalent to the whole, but proportional to it.

There is no dearth of physical indices. In fact so many of them are being reported upon today that the teacher and administrator are hard put to it to decide which will best serve his purposes. The advantages of a sound testing program are rather generally recognized. Not so clearly recognized are the factors responsible for making a testing program successful. One essential factor is adequate knowledge of tests and their significance. In this paper many important contributions to the present status of physical indices have been summarized, and some mention has been made of the limitations and the legitimate uses of certain indices.

Physical indices may be classified according to whether they concern body dimensions and proportions, body functions as such, or performance in work or play. Although the indices of performance reflect educational achievement to a greater extent than either the somatometric or physiometric indices, all three groups have something of value to contribute to our knowledge of man and his problems.

SOMATOMETRIC INDICES

Somatometric indices have been developed from measures of age, height, weight, diameters, and girths. Some of these are indices of growth, health, and nutrition; others are indices of size, body build, and maturity.

For a discussion of anthropometry as it is related particularly to health and physical education, reference may be made to McCloy's two monographs on the appraisal of the physical status of children and to his recent text on tests and measurements.[1, 2, 3*] The technique of measure-

This article is based on a paper presented before the New England Health Education Institute, April 1939, Cambridge, Mass.

* References are to numbered Bibliography at end of article.

ment is of fundamental importance because it affects the reliability of the results. Absolute precision in measurement is, of course, unattainable. However it is possible to discover many sources of error and determine their approximate order of magnitude. If the degree of precision is not sufficient for the purpose of the measurement, ways and means of minimizing sources of error must be devised or the plans for using the measurement must be changed so as to be in accordance with the degree of precision that can be attained.

Notable studies concerning the rate of growth have been made by Baldwin and by Meredith at the Iowa Child Welfare Research Station, and by Porter, Dearborn, and others at Harvard. Baldwin developed the well-known height-weight tables which were based upon extensive data published in 1921. Baldwin found that growth in height is comparatively uniform from year to year between the ages of seven and seventeen, but that the rate of growth in weight tends to increase with age.[4] Meredith's study, based on data gathered over a fourteen-year period, gives tentative norms for eighteen anthropometric measurements for boys from birth up to eighteen years of age. In general there is a period of rapid growth extending from birth to two years, a period of slow growth between two and eleven years, a second period of rapid growth from eleven to fifteen, and a final period of slow growth between fifteen or sixteen and eighteen years.[5] A similar alternation of rapid and slow growth periods no doubt occurs also in girls. Porter called attention to the fact that growth was seasonal, being more rapid in the fall than in the spring. Porter also made a very interesting set of charts to show the variability to be expected in weight for various age groups. With the help of these charts an individual's percentile rank for height and for weight can be determined. Gains or losses in percentile rank were considered of more importance than gains in inches and pounds. Gains in height unaccompanied by a corresponding gain in weight were found to be almost invariably associated with illness of some kind.[6] A complete account of the Harvard Growth Study has not yet been published, but the data has been made available to a number of investigators whose work has been reported from time to time. A recent monograph published by the National Research Council gives an outline of the study, an annotated bibliography of reports to date, and a summary of data for a large number of individual cases.[7]

Normalcy of growth and nutrition is associated with normal increases in height and weight. Turner and his coworkers have found that school children with small gains in weight were distinctly inferior in respect to health behaviour, the amount of illness, and the number of physical defects.[8] Turner also reported that the most rapid gain in weight occurs during the fall and early winter, whereas the least rapid gain in height occurs during this period.[9] The implications for a weighing and measuring program are to keep cumulative records over long

periods of time, making allowances for expected seasonal fluctuations, and eliminating if possible the causes of subnormal growth. It is to be noted, however, that according to Hobson who had access to the extensive records of the Harvard Growth Study, the rate of growth during adolescence was not related to school achievement.[10]

The American Physical Education Association Committee on Physical Examinations for Girls and Women has recommended weighing and measuring as an *educational* procedure for the growing child and as a means of discovering sudden or prolonged changes in weight. This committee did not recommend the use of height-weight tables for college women and doubted their value for children. Attention was called to the fact that the services of specially trained workers were needed if weight was to be used as a factor in judging nutritional or health status.[11]

Granted that height-weight tables are inadequate as measures of health and nutrition, has anything better been proposed? Shouldn't there be some relation between the skeletal framework of the body and the amount of soft tissue, i.e., between bony dimensions and weight? It would seem that both of these questions can be answered in the affirmative.

In 1934 the American Child Health Association proposed the ACH nutritional index. The difference between arm girth and chest depth is evaluated in relation to hip width.[12] As a means of selecting undernourished children it was supposed to be much superior to the ordinary height-weight tables, but according to some workers it does not select a large enough percentage and the selection does not correspond very well with the doctors' ratings.[13]

According to Pryor, hip width should be considered as well as age, height, and sex in determining normal weight. Her width-weight tables have seven subdivisions of hip width for each inch of height. Separate tables are made for each age and sex.[14]

The fundamental importance of body proportions and symmetry has been emphasized by Willoughby, who has presented tables for determining normal weight from a weighted ankle girth index. This index is obtained from measurements of hip and shoulder width, and from wrist, knee, and ankle girths. This investigator calls attention to the fact that predictions of body weight from bony framework are much more satisfactory for boys and men than for girls and women because the amount of subcutaneous fat and musculation is more closely related to skeletal development. In girls and women there is more variation in fat and muscular tissue, i.e., a smaller portion of weight is accounted for by bony framework.[15] Although it is somewhat cumbersome, the Willoughby method (with some revisions) has been used successfully by Dr. Turner at Mt. Holyoke College for a number of years.

The only method of weight prediction for college women reported favorably by the A.P.E.A. Committee on Physical Examinations for

Girls and Women in 1934 was that of Boillin who worked out a regression equation for predicting weight from measurements of chest depth, chest width, shoulder width, hip width, and height. The factor of age was excluded because it is of negligible importance as a determiner of weight for college women.[11, 16] A simpler plan of prediction from chest width, chest depth, and height has been presented by Ludlum. She has been able to short-cut most of the labor of making prediction tables because the statistical weightings assigned to the chest measurements in centimeters corresponds almost exactly with the weighting for height in inches. Her method has about 70 per cent more predictive efficiency than the ordinary height-weight tables.[17]

A very interesting series of studies on tissue symmetry and physical development has recently been reported by Cureton. Adipose and muscular tissue as well as bone size were considered in determining body weight for boys and college men.[18, 19]

The average weight is not necessarily the normal or ideal weight. Any average is made up from larger and smaller values. With regard to weight it is reasonable to suppose that there is a zone of normality flanked on either side by zones of moderate and marked deviation, but real difficulties arise when an attempt is made to interpret weight deviations in individual cases. The per cent overweight and underweight is probably more significant than the number of pounds above or below the norm. A convenient weight variation percentage chart has been published by Alway.[20] But what does it mean when an individual is 15 pounds overweight, or 12 per cent underweight? According to one investigator, individuals with greater weight do not have proportionate amounts of bone, muscle, and fat, but a disproportionate amount of fat. Adipose rather than muscular abundance characterized individuals of stocky build, a finding which is contrary to the usual opinion.[21] Furthermore Cureton states that the weight residuals (the differences between actual weight and weight predicted from measures of bone size, muscular tissue, and adipose tissue) do not correlate well with any other objective measures of body development or nutritional state.[18, 19] The causes of weight deviation may be so numerous that no single factor would occur frequently enough to be reflected in terms of correlation coefficients. Clearly, the interpretation of weight as an index of health or nutrition should be only in the hands of experts. The lay worker can obtain the data and refer to the experts those individuals who deviate markedly from the norm, but he should not presume to make unwarranted interpretations.

It might be mentioned in passing that problems of nutrition are being approached from the point of view of physiology and biochemistry as well as from that of anthropometry. One long-term cooperative research program along this line is being conducted by a group of colleges in the central section of the country,[22] another is being financed by the Milbank Memorial Fund in New York City.[23]

The problem involved in bringing an underweight group toward a not too strictly defined norm is not simply a matter of adding body weight. An augmented diet may merely increase the storage of fat and carbohydrate. Presumably graded exercise is the stimulus for building muscle and strengthening the bony framework.[24] The solution of nutritional problems will therefore require cooperative effort on the part of several professional groups, particularly doctors, nutritional workers, and physical education teachers. The somatometric indices discussed above are among the tools they employ in determining initial status and measuring progress in growth and nutrition.

Another group of somatometric indices has to do with body build. Perhaps the most satisfactory of these is the Davenport ratio of weight to the square of the chest girth. Chest girth varies with stature, therefore height may be used instead of chest girth in the body build index. The ratio of weight to the square of the height is a better index of build than the ponderal index in which the cube root of the weight is divided by the height.[25] Gould's study of the physique of women students at Tulane University showed that the trend over a period of years was toward a slightly more slender build. This resulted because there was a slight increase in height without a corresponding increase in weight.[26] At the University of Pennsylvania, Gammon commented upon the striking variations in weight and build among incoming college men and the no less striking changes that occur during the four years of college life.[22, 24]

How are indices of size, maturity, and body build related to performance in physical education activities? What are the effects of exercise upon body structures? Are the answers to these questions the same for girls and women as for boys and men? Both boys and girls have often been classified for instruction and competition according to their size and maturity. The feminine type of body build has been thought to be a handicap in athletic performance, and some have held the belief that strenuous exercise for girls is not desirable because it might make girls more masculine.

It is generally agreed that for purposes of instruction and competition in physical education activities, classification according to age, height, and weight is very satisfactory in the case of boys and men, but of questionable value for girls and women.[27, 35] Some evidence to the contrary was presented by Parker in 1932. She correlated ponderal index with a strong criterion of motor ability and obtained a coefficient of .385. If body build does affect performance scores, this somatometric factor might well be included in the test battery, thus making it unnecessary to establish standards for various types of body build. The ponderal index is not a very strong factor in motor ability, but it has consistently low intercorrelations with other factors and can therefore add to the predictive value of a test battery.[36]

An index of femininity of body build was worked out by Carpenter. Her femininity scale was constructed on the basis of differences between the average measurements for college men and women. The correlation of femininity scores with a battery of track and field events was scarcely significant (—.189). In other words, the musculine type of build may be a slight advantage, but for practical purposes in programs of physical education the matter of build as related to masculinity or femininity may be disregarded.[37] Constant and vigorous exercise is reported to cause increased growth and development among young colored women, but no marked trend toward masculinity of build.[38]

PHYSIOMETRIC INDICES

Measurements of such items as vital capacity, pulse rate, blood pressure, and muscular strength are combined in various ways with structural or performance measures to give indices of functional proficiency. These are obviously more subject to change than the somatometric indices just discussed—they are influenced by environmental factors and motor activity to a greater extent, and by heredity to a lesser extent. Since organic soundness and functional efficiency of the human mechanism is one of the avowed objectives of a physical education program, these indices might reasonably be expected to be of assistance in evaluating activity programs and the progress of individuals and groups.

Breathing capacity as measured on the spirometer has long been thought to be a good test of physical condition. The White House Conference Report states that it is a test of physical endurance and robustness, and that low vital capacity scores are often associated with impaired health.[39] The A.P.E.A. Committee on Physical Examinations reports that vital capacity seems to have some significance as a means of arousing interest, as a possible basis (together with other findings) for classification, and as a measure of present status with which future measurements can be compared.[11] The vital capacity test is used almost universally as a part of physical and medical examinations. It has also been included in tests of physical fitness.[40]

Of what significance are breathing capacity scores? Cureton discusses this matter at some length and comes to the conclusion that it is predominantly a measure of body size—the larger the person is, the greater his vital capacity should be. Before studying vital capacity in relation to such factors as fitness and motor ability, the breathing capacity scores must be corrected for body size.[41]

The size measures commonly used to determine breathing capacity norms are height, surface area, and body weight. Norms for boys and girls from twelve to eighteen years of age have been worked out by Kelly.[42] For college women norms have been established by Turner and by Dennis.[43, 44] The percentage normal vital capacity score is the ratio of the actual score to the norm; it is a vital capacity residual, a raw score corrected for body size.

In a current study at Wellesley College, percentage normal vital capacity scores were found to have no significant correlation with postural measurements or motor ability scores. However, medically restricted students had decidedly lower scores than those whose physical education activities were not restricted. Whether the lower scores are due to poor health per se or to the curtailment of activity has not been determined.[44] Turner compared a group of 123 Mount Holyoke students who had vital capacity scores 15 per cent or more above the norm with a group of 86 students who had scores 15 per cent or more below the norm. The low group was at a decided disadvantage with respect to academic, athletic, and social standing.[43]

The wisdom of including a breathing capacity test in the Rogers strength and physical fitness indices has been questioned. McCloy found that the vital capacity score contributed very little to the predictive value of the Rogers test as a test of motor ability.[45] Van Dalen, after correcting vital capacity scores by the Kelly method, obtained a correlation with the Rogers physical fitness index of .20 for 12-year-old boys and .22 for 17-year-old boys. He therefore suggests that this item be omitted from the Rogers test.[46] Before carrying out such a suggestion it might be well to determine the validity of both breathing capacity and muscular strength as measures of health and fitness. Possibly the breathing capacity test should be retained and the strength tests omitted.

As to the interpretation of breathing capacity scores in the routine examination of a relatively healthy school population, a great deal of caution must be exercised. We must recognize the face that the "raw" scores are chiefly a reflection of body size, and that the scores corrected for body size have little diagnostic value apart from other findings. As in the case of body weight it is important to note trends over long periods of time. Individuals deviating markedly from a group average should probably be subjected to close scrutiny, but at the present time authoritative statements, especially by non-medical examiners, as to the interpretation of low breathing capacity scores in terms of health or "training" are unwarranted.

Of the tests for cardiovascular efficiency the Tuttle pulse-ratio test seems to be the most promising. The pulse for two minutes after a prescribed exercise is divided by the resting pulse for one minute. A person in good condition tends to have a lower initial pulse rate, a smaller increase upon exercise, and a smaller pulse-ratio.[47, 48] Scores on this test correlate well with endurance as measured in athletic performance.[49, 50] With the aid of this test it is possible to distinguish (to a reasonable extent) between organic efficiency and technical skill—lack of successful performance in an athlete with a good pulse-ratio score is usually due to poor form and technical inefficiency. The qualities of stamina and endurance, the ability to perform at a fairly high dynamic level over long periods of time, are developed through systematic and long continued

training. Progress in developing endurance might be measured and motivated by some such test as the pulse-ratio test. Other fitness and endurance tests have been described by Schneider.[51]

Strength measurements have always been of considerable interest in physical education. Without doubt a certain amount of strength is prerequisite to any kind of motor performance. The element of strength is combined with speed of movement to give power; it is also a factor in efficient endurance—a load that could be carried a long time by a strong man would tire a weak one more quickly, i.e., it is harder to "overload" a strong man.

Measures of pure strength are difficult to obtain because the manifestations of strength are almost inextricably dependent upon such factors as speed of motion, will power, co-ordination, and fatigue. The Martin resistance type of strength test is probably the most satisfactory test of pure strength. Muscle groups are tested separately, thereby avoiding the necessity for much skill and coordination. The speed factor is eliminated because it is a question of resisting the pull of the operator rather than shortening muscles. The stimulus to resistance is relatively uniform, depending somewhat upon involuntary reflexes as well as upon will power.[52, 53] Scores on the Martin test do not improve appreciably with practice. Total strength divided by weight gives the Martin strength index. High strength-weight ratios signify good muscle quality and good innervation, also a good proportion of muscular to other tissues.[51]

In the Sargent type of strength test, the subject pulls as hard as he can against a dynamometer. The scores depend upon will power and coordination as well as upon pure strength. The hand grip, the back and leg lifts, and the chest push and pull are examples of this type of test. If the subject is properly motivated and allowed to develop the necessary skill, these tests are a good measure of strength. With girls special care must be taken to reach the necessary level of skill and effort.[54, 55]

The push-ups and pull-ups which have been used as part of the Rogers strength index involve a considerable amount of skill and endurance as well as strength. If the strength per pound of body weight is low, the body weight constitutes an overload, therefore this type of test is not very suitable for measuring small amounts of strength. That push-ups and pull-ups involve a greater amount of skill than the back and leg lifts is shown by comparing the percentage improvement after a period of special training. Such a comparison was made for a group of high school boys after six weeks of special training. Gains for the right and left grip, back lift, and leg lift were 15 per cent, 24 per cent, 17 per cent, and 16 per cent respectively, whereas gains for push-ups and pull-ups were 194 per cent and 323 per cent respectively.[56]

There is need for a simple and direct measure of strength. The

Rogers strength index does not meet this need because height, weight, and vital capacity are included as factors in his test battery.[57] The push-ups and pull-ups are not altogether satisfactory, especially for girls and women. A simple push and pull on a dynamometer held in front of the chest was found to be more valid as a strength test and more closely related to athletic performance than the push-ups and pull-ups.[58] A resistance type thigh flexor test was found to be better as a measure of motor ability than any of the Rogers test items.[59]

The correlation of any strength test with athletic performance is always much lower for girls than for boys. Anderson, for example, reports that for girls the correlation between the Rogers strength index and athletic ability is only .44 for girls as compared with .76 for boys. Her best measure of strength correlated .55 with athletic ability as measured by performance in track and field events for girls. Performance in other types of physical education activity would be less closely related to strength than this.[59] But even for college men strength seems to be less of a factor in athletic ability than Rogers would lead us to believe. At the University of Virginia, for example, strength was found to be of little significance except in the case of track and swimming.[60]

The Rogers strength index divided by the norm for sex, age, and weight gives an index of physical fitness which has been used with considerable success in the motivation and redirection of physical education programs.[61] The validity of this physical fitness index was established in a rather sketchy fashion by Chamberlain and Smiley in 1931. Sixty-five Cornell students, including varsity athletes and those who were markedly handicapped were classified by the medical examiner and by the physical fitness index as superior, average, and handicapped. The correlation between these two measures was only .60, and this coefficient is probably spuriously high because of the way the subjects were selected. The authors concluded that the physical fitness index was valid as a rough measure of physical fitness for big-muscle activities.[62]

It has been assumed that the tests were as valid for girls and women as for boys and men. A study at the University of Wisconsin indicates that such an assumption is unwarranted.[63] Doubt as to the validity of the Rogers test has been expressed by the *Journal of the American Medical Association*.[64] On the other hand many investigators have found this test extremely useful in motivating health and activity programs and measuring the effects of various physical activities on physical fitness. Hernlund says, for example, "The more we investigate tests of physical efficiency, the more apparent does it become that the P.F.I. is a measure of very high validity and possesses many special, if not unique merits as a measure of the efficiency of the human body." [61]

Although tests and norms may need to be revised from time to

time in accordance with progress in the testing field, the basic idea of physiometric indices appears to be sound. Respiratory, cardiovascular, and neuromuscular efficiency are undoubtedly related to health and motor performance. Certainly some type of objective measurement should be employed to direct attention to the physical needs of individuals and to motivate a program for meeting those needs in an effective manner. The members of the medical profession have been concerned too little with the optimum development of relatively healthy young people to be of much use to the members of the physical education profession who deal primarily with such problems. Both groups are a bit suspicious of research workers who employ statistical tools. A very special kind of cooperative work by these three groups is needed before much progress can be made in regard to the interpretation of physiometric indices.

INDICES OF MOTOR PERFORMANCE

Motor performance tests have been devised for such fundamental skills as running, jumping, and throwing, and for specific skills in physical education activities. Broadly speaking, all are indices in the sense that they represent general motor ability or proficiency in the activity as a whole. However, many of these performance tests are evaluated in relation to norms of some kind, giving an index which is presumably more significant than the performance score itself.

Much of the literature on the subject of motor performance indices has been summarized and discussed in recent texts.[3, 65, 66] Apparently tests are available for almost any purpose that might be mentioned, but a great deal of discrimination is needed to be able to select those that are both suitable and effective for a given purpose. Some tests have been fully standardized, i.e., they have been developed according to acceptable statistical procedures—the degree of validity, reliability, and objectivity is stated, and a means of scoring has been worked out. Unfortunately very few tests have been fully standardized; the majority are partially standardized; others have not been subjected to statistical analysis of any kind. Obviously, the "goodness" of a test is independent of the statistical treatment that it has received—all standardized tests are not equally good. However, in the standardization process, convenient measures of goodness are made so that it is possible to judge the relative merits of various tests.

Outstanding work with indices of motor performance has been done by McCloy and his followers at the University of Iowa. With the help of statistical tools they have been able to isolate, identify, and measure such fundamental factors in motor performance as strength, speed, body size, endurance, sensori-motor coordination, and motor educability. The strength factor may be measured satisfactorily in various ways. Wendler suggests a simple four-part battery of resistance tests. Suggested tests of the speed or velocity factor are the Iowa revision of the Brace test,

the Sargent jump, broad jump, 3-pound shot-put, and 60-yd. dash, but these do not measure speed as well as the strength tests measure strength. Basketball skills and certain parts of the Johnson test are quite promising as tests of motor educability. Baseball tests were found to be the best measures of sensori-motor coordination. After securing adequate measures for the various elements of motor ability, the next step would be the development of a weighted battery of tests which would be of value for diagnostic purposes as well as for classification for instruction and competition.[67, 68, 69]

In the search for a means of comparing achievement in one track and field event with that in an entirely different event, McCloy became convinced that such a comparison could be made on the basis of the muscular power demanded of the performer. Horsepower on a mechanical basis (the amount of work per unit of time) was therefore adopted as a measure of performance. A given point score represents the same expenditure of power in any of a large series of track and field events. Such performance scores divided by the norm for the individual's size classification index gives an athletic quotient which is a measure of superiority or inferiority within an age, height, and weight group. A child who simply grows will improve to some extent in motor performance. The athletic quotient will indicate whether this is just growth or whether it is due to real improvement.[3, 70]

Kistler reports that a relatively large number of tests may be used effectively as classifying devices for junior and senior high school boys. When quick, effective classification is the major consideration the score on the 8-pound shot-put is the first choice. This correlated .897 with a strong motor ability criterion. When additional information is desired, McCloy's general motor capacity test, which correlates .871 with the motor ability criterion, would probably have most to recommend it. Track and field events rank high as classifying devices, the standing broad jump and running high jump correlating .840 and .833 respectively with Kistler's motor ability criterion. The Rogers strength index is somewhat better than the McCloy size classification index (.827 as compared to .787), but McCloy maintains that instead of handicapping on the basis of strength, it is more logical to handicap according to the fixed qualities of age and size and hope to develop strength.[70, 71]

The problem of classifying girls for physical education instruction and competition is somewhat different from that of classifying boys because age, height, and weight seem to have little influence upon performance. Adams suggested that the Sargent jump would be a valuable part of a battery for classifying girls for individual athletic performance.[32] Classification on the basis of the Rogers indices of strength and physical fitness has been tried with some success, but it is decidedly less satisfactory for girls and women than it is for boys and men.

The Humiston test, consisting of seven events arranged in the form of a single race, emphasizes speed and agility rather than strength. It is recommended as a means of classifying college women.[72] The Johnson test has also been used rather successfully for this purpose.[73]

The Graduate Department of Hygiene and Physical Education at Wellesley College has developed a number of performance test batteries for college women and high school girls. The present selection for college women is a six-part battery composed of the medicine ball throw, baby hurdles, ball catch, velocity throw, jump and reach, and scramble. The elements of speed, skill, strength, and endurance are all represented, and the test is quite interesting to take and easy to administer. A three-part battery composed of the standing broad jump, baby hurdles, and scramble has been used with considerable satisfaction at the Newton High School. This Newton test has been thoroughly standardized. It correlates .908 with an extensive objective criterion and .734 with a well-established subjective rating of motor ability. The Rogers strength index correlated .544 and .402 with these same criteria. The Newton test is therefore unquestionably superior to the Rogers test as a measure of motor ability for high school girls.[74, 75]

Another very interesting study in the women's field has been reported by Graybeal of Minnesota who attempted to measure the outcomes of physical education for college women. Improvement occurred in attitudes toward health and physical activity, in information concerning health and physical activity, in general big muscle ability, and in physical efficiency as measured by the pulse-rate tests. It was therefore concluded that a college requirement in physical education would seem to be justifiable. It was also implied that the scope of health and physical education at the college level was a wide one, requiring cooperative effort of the whole college community to make it effective.[76]

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Accuracy in Securing Pulse Rates by Palpation

By A. T. Slater-Hammel
Graduate Student in Physical Education
and L. K. Butler
Associate Professor of Physical Education
The Psychological Laboratory, Oberlin College

MANY of the testing and measuring programs in physical education require taking a pulse count. To gain some idea of the accuracy in securing pulse rates by palpation, the method generally used, the rates secured by nine persons trained in palpation were compared with the rates secured from simultaneous plethsymograph recordings.

APPARATUS AND PROCEDURE

The apparatus used included a Wiersma Hand Plethsymograph, pneumatic recording unit, foot contact plate, magnetic marker, and kymograph. A complete description of the apparatus and the technique of recording pulse beats has recently been published.[1] The disposition of the subject, position of person palpating, and arrangement of apparatus in this investigation is shown in diagramatic form in Figure I.

The Campbell Pulse Ratio Test[2] was used in the trials of this study. This test requires taking the pulse while the subject is sitting and again after a period of prescribed exercise. The exercise called for consists in mounting a stool 13″ high at the rate of 28 times per minute for 3 minutes. Since, however, this study was not particularly interested in the pulse ratios secured* the exercise period was reduced to 2 minutes to save time.

The subject from whom the pulse was to be taken was instructed in mounting the stool. The sequence in mounting and dismounting was left foot up, right foot up, left foot down, right foot down and upon contact plate. The subject was permitted to make several trials in mounting and dismounting.

The person palpating the pulse was given the following instructions:

You will secure the normal pulse rate from the left hand while the subject is seated. You may do this in any manner you are accustomed to doing,

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1 Slater-Hammel, A. T., and Butler, L. K., "A Mechanical Pulse Recorder for Pulse Rate Tests," Res. Quar. 11:1 (March 1940) 3-8.

2 Campbell, J. M. H. "Weight, Vital Capacity, Pulse Rate Before and After Exercise and Physical Fitness in Health," *Guy's Hospital Reports*, 75: 1–4 (1925) 263.

* The pulse ratio is secured by dividing the total pulse rate secured for 2 minutes following exercise by the pulse rate per minute at rest.

taking the count for 15 seconds, one half minute, or for the full minute. After you have determined the rate per minute, the subject will mount the stool at the rate of 28 times per minute for 2 minutes. At the end of the 2-minute period of exercise, the subject will remain standing, and 5 seconds after the subject has finished the exercise you will count the pulse every 30 seconds for 2 minutes. You need not try to record the rates for every 30 seconds; simply call the rate out and it will be recorded for you.

When the subject was thoroughly acquainted with the method of mounting the stool and he had had sufficient time to recover from the trials (five minutes), he was comfortably seated in a chair and the plethsymograph was secured in his right hand. With everything in readiness for securing plethsymograms, the kymograph was started and the person palpating was given the signal to take the normal pulse. After this rate was obtained, the subject stood up and started his period of exercise. Upon finishing the exercise, the subject remained standing and the rate was palpated as previously instructed.

DIAGRAM OF APPARATUS, DISPOSITION OF SUBJECT, AND POSITION OF PALPATER FOR SIMULTANEOUS PALPATION AND PLETHSYMOGRAPH RECORDING.

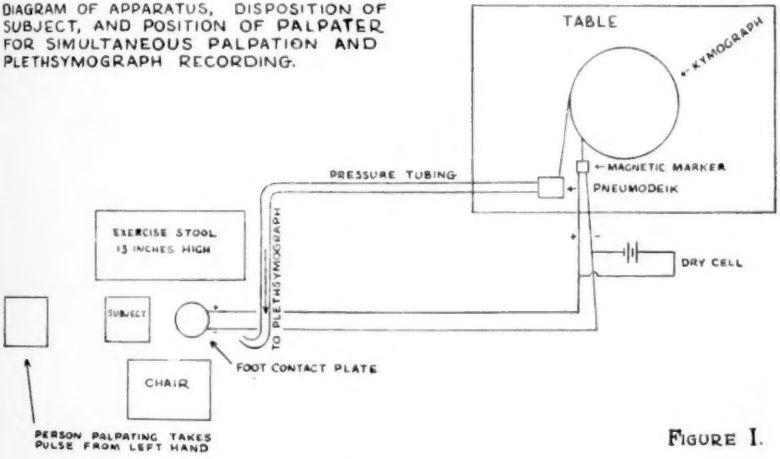

FIGURE I.

To facilitate reading the kymograph record, the drum was set to make one revolution in about 3 minutes. The pulse while sitting was recorded on the upper half of the drum. After this rate was recorded, the drum was stopped and while the subject exercised the drum was raised for recording the pulse on the lower half immediately after exercise. The kymograph was started again just before the end of the exercise period.

The thirty subjects used for this investigation were taken from the physical education classes of Oberlin College. Five resident physicians of Oberlin and four members of the Oberlin College Physical Education Department palpated. The number of subjects each person palpating handled varied from two to six, depending upon the amount of time each was able to give to the experiment.

FINDINGS

Tables I and II give a summary of the pulse rates obtained in this investigation. A comparison of the rates obtained by palpation with simultaneous plethsymograph recordings indicate that there can be considerable error in securing pulse rates by palpation. The errors in securing the normal pulse by palpation range from —12 to +4, and in securing the total pulse for the 2 minutes preceeding exercise from —33 to +36. The errors in some instances are great enough, according to the Campbell classification, to throw a subject from a good group to a poor group.

The series in E and M show surprisingly accurate pulse counts by palpation. These two series seem to indicate that some persons are able to palpate with considerable accuracy. A further and extensive study would be required, however, to ascertain the reliability of these persons.

On the whole, this investigation indicates a vital need for an accurate mechanical method for taking pulse counts in testing programs in physical education.

TABLE I

NORMAL PULSE RATES

Group	Palpation	Plethsymograph Recording	Error	Group	Palpation	Plethsymograph Recording	Error
K-1	102	114	—12	T-2	72	72	— 0
K-2	88	93	— 5	T-3	76	78	— 2
K-3	88	91	— 3	T-4	64	63	+ 1
K-4	86	86	— 0	T-5	58	57	+ 1
E-1	70	70	— 0	T-6	101	105	— 4
E-2	66	67	— 1	B-1	86	85	+ 1
E-3	80	79	+ 1	B-4	84	85	— 1
D-1	77	81	— 4	M-1	70	70	— 0
D-2	72	80	— 8	M-2	50	58	+ 1
D-3	74	75	— 1	M-3	78	79	— 1
D-4	77	83	— 6	M-4	76	75	+ 1
S-1	69	69	— 0	I-2	64	60	+ 4
S-2	73	73	— 0	I-3	76	76	— 0
S-3	71	69	+ 2	H-1	62	61	+ 1
T-1	71	70	+ 1	H-2	94	94	— 0

TABLE II

PULSE—5 SECONDS AFTER EXERCISE

Group	1st 30 sec. Palp.	Rec.	2nd 30 sec. Palp.	Rec.	3rd 30 sec. Palp.	Rec.	4th 30 sec. Palp.	Rec.	Total Palp.	Rec.	Error
K-1	66	70	60	55	62	53	57	54	245	232	+13
K-2	60	60	56	67	56	64	54	65	226	256	—30
K-3	67	71	67	56	62	54	58	53	254	234	+20
K-4	66	66	60	63	57	66	55	58	238	253	—15
E-1	42	47	40	38	37	38	33	38	152	161	— 9
E-2	49	48	40	39	37	39	35	41	161	167	— 6
E-3	58	57	46	47	44	44	43	47	191	195	— 4
D-1	34	69	35	57	33	60	30	58	132	244	—11
D-2	47	51	36	44	36	43	37	45	156	183	—27
D-3	46	58	39	45	36	41	37	38	158	182	—24
D-4	44	59	42	48	40	44	35	43	161	194	—33
S-1	50	48	45	35	38	39	39	41	172	163	+ 9
S-2	52	51	46	45	45	42	44	44	187	182	+ 5
S-3	57	55	41	42	40	41	42	41	180	179	+ 1
T-1	52	51	50	41	32	39	32	43	116	174	— 8
T-2	49	52	43	41	37	40	41	40	170	173	— 3
T-3	56	58	43	44	36	43	41	44	176	189	—13
T-4	43	44	34	33	34	36	32	39	143	152	— 9
T-5	44	46	34	34	31	32	31	31	140	143	— 3
T-6	62	64	59	58	51	57	49	57	221	236	—15
B-1	52	54	47	48	47	48	49	49	195	199	— 4
B-2	56	64	51	50	50	51	49	50	206	215	— 9
M-1	37	37	32	32	30	31	31	30	130	130	— 0
M-2	44	45	41	40	38	39	40	40	163	163	— 1
M-3	59	58	49	47	46	47	52	49	206	201	+ 5
M-4	59	59	52	51	50	50	49	49	210	209	+ 1
I-1	54	48	45	37	47	34	46	37	192	156	+36
I-2	52	54	42	43	42	40	42	43	178	180	— 2
H-1	39	42	34	34	32	31	34	33	139	140	— 1
H-2	56	56	49	50	46	45	45	49	196	200	— 4

A Study of Intramural Sports Participation and Scholastic Attainment

By Paul R. Washke
Professor of Physical Education
University of Oregon;
Vice-President (Physical Education) A.A.H.P.E.R.

TODAY, intramural sports are receiving greater attention and recognition in the schools than ever before. Once under way, the movement has gradually gained momentum until it has become one of the traditions of student life in most of our high schools as well as our colleges and universities. The intramural program has popularized sports, so to speak, and has made a definite contribution to the welfare and recreational interest of the mass of students not engaged in interscholastic participation.

In the establishment of an intramural program at any institution, those who are to administer it should have fixed in their minds definite objectives of such a program. Progress can be made only through an increase in amount and accuracy of objective evidence in that field. It is therefore essential that intramural directors know rather definitely, in terms of units that can be handled statistically, just what the outcomes of the program are. Are the objectives which were set up being attained and to what degree?

In his new edition of *Intramural Sports,* Dr. Elmer D. Mitchell of the University of Michigan has outlined what he considers to be the objectives of the intramural program. He lists recreation, social contacts, group spirit, better health, permanent interest in sports, development of varsity material, bodily prowess, and *scholarship.* [1]

Concerning the effect of intramural athletics on scholarship, he states:

> While few studies have been made to show correlation between intramural participation and scholastic attainment, nevertheless, the experience of the University of Michigan has given warrant for a favorable conclusion. Each year the fifty or more fraternities are graded according to their all-round athletic efficiency. For several years there has been a close correlation between high athletic efficiency and a high position in the scholastic standings. With very few exceptions the high ten intramural groups have been listed within the high twenty scholastic groups. Frequently the high individual point

1 Elmer D. Mitchell, *Intramural Sports* (New York: A. S. Barnes and Company, 1939) 22.

winners who have taken part in many sports are Phi Beta Kappa students; and, although no satisfactory proof is yet forthcoming, the conclusion seems safe to draw that intramural participation does not militate against good scholarship.

Hackensmith and Miller in "A Comparison of the Academic Grades and Intelligence Scores of Participants and Non-Participants in Intramural Athletics at the University of Kentucky," came to these conclusions:

1. That freshman participation in intramural athletics does not have a marked effect upon the student's academic grade.
2. That participants in intramural athletics as a whole have a higher mean intelligence sigma ranking than those who do not participate.
3. That sophomore participants show a slightly higher mean academic grade and that junior and senior intramural participants demonstrate a definitely higher mean academic grade than do non-participants of the same classes.[2]

THE PURPOSE OF THIS STUDY

The purpose of this study was to determine what effect, if any, intramural sports participation had on the scholastic attainment of certain men students at the University of Oregon.

PROCEDURE IN COLLECTING AND ORGANIZING DATA

The intramural sports program, as conducted at the University of Oregon, was selected as offering a satisfactory situation in which to make this kind of study because of the type of program which is carried on throughout the entire school year, and because of the investigator's acquaintance with that program.

Participation records of every student competing in any branch of activity under the intramural sports program are kept on file in the office of the School of Physical Education. This record includes the student's name, his class, organization represented, sports participated in, and total number of activities in which he participated throughout the year. A sample record is shown on page 24.

At the beginning of any tournament, or meet, or contest, the athletic manager of each organization supplies the scorer of that contest with the above listed information relative to the competing individuals. This data is then transferred from the scorer's sheet to the participation records.

From the sample record it is seen that "Richard Roe" was a sophomore, competing in 1932-33, belonging to the "Phi Psi" organization. He competed in seven different activities. A cross (x) signifies those activities in which he took part.

[2] C. W. Hackensmith and L. Miller, "A Comparison of the Academic Grades and Intelligence Scores of Participants and Non-Participants in Intramural Athletics at the University of Kentucky," RESEARCH QUARTERLY 9:1 (March 1938) 94.

INTRAMURAL SPORTS — PARTICIPATION RECORD — UNIVERSITY OF OREGON

Name Richard Roe
Class '35
House "Phi Psi"

1932–1933

TOTAL 7

	Swimming	Water Polo	Basket Ball	Volley Ball	Hand Ball	Ping Pong	Soft Ball	Track	Golf	Tennis	Boxing	Wrestling	Cross-Country	Horseshoes	Fencing	Badminton	Sigma Delta Psi
Inter-House		x	x	x	x		x			x		x					
Class "B"																	
All Campus																	
Singles																	
Singles																	
Doubles																	
Fall																	
Winter																	
Spring																	

With these participation records filed for a number of years, it is not too difficult to secure reliable data over a considerable length of time. For purposes of this investigation, participation records for a period of five consecutive years, from 1931–1936, were studied.

As an introductory perspective to the extent of the program at the University of Oregon, the following table will show, for each of the five years, the number of different activities included in the intramural program, the number of student participants, and the percentage these participating students represent of all the men students enrolled in the university during those years.

TABLE I

THE NUMBER OF ACTIVITIES AND NUMBER OF STUDENTS PARTICIPATING IN INTRAMURAL ATHLETICS (1931–36)

Year	Number of Activities	Number of Participants	Percentage of Men Enrolled
1931–32	13	880	50
1932–33	15	800	62
1933–34	15	749	63
1934–35	14	927	65
1935–36	13	820	54.5

Before proceeding with the technique involved in the collecting of the data, it became necessary to set up some criteria to limit and define "intramural participation." For this study those students who had taken

part in a minimum of five different activities during a year and a maximum of eight were selected. This means that the students selected were probably actively engaged in some sport throughout the entire year. It will readily be recognized that it would not be justifiable to make use of the records of students competing in only one or two activities, for their participation would be merely spasmodic.

Upon examining the participation records, it was found that during the five years (1931-1936) there were 271 students who had competed in from five to eight activities inclusive. Table II shows the number of participants for each year:

TABLE II

NUMBER OF STUDENTS PARTICIPATING IN FROM 5 TO 8 ACTIVITIES

Year	Number	Year	Number
1931–1932	37	1934–1935	78
1932–1933	46	1935–1936	48
1933–1934	62		
		Total	271

Note: These figures represent the number of students who competed in from one to eight activities during each year (5–8 inclusive).

In order that the results of any measurement, either direct or indirect, may be of scientific or technical value, it is necessary to isolate control factors that may have a bearing on the problem. The next logical consideration to take into account, therefore, was that of determining control factors pertinent to the group which could be objectively secured.

By referring to the permanent record sheets (filed in the University Registrar's office) the following objective data pertaining to each of the 271 intramural participants was secured as control factors:

1. The student's age.
2. The student's class standing, i.e., freshman, sophomore, etc.
3. The subject in which the student was majoring, i.e., law, medicine, etc.
4. The rating scored in the psychological entrance examination.
5. The student's quartile standing in his high school graduating class.

The scholastic grades of each participant were obtained from his permanent record sheet. The total number of term hours and grade points was then tabulated and the grade point average for the whole group computed. Table III portrays the results of this tabulation.

The grading system used at the University of Oregon consists of four passing grades: A, B, C, and D, and failure, F, incomplete (Inc.), and withdrawal (W). Grade points were computed on a basis of three points for each hour of A, two for each hour of B, one for each hour of C, zero for each hour of D, and a minus one for each hour of F. Marks

of Inc. and W. were disregarded in the computation of points. The grade point average (G.P.A.) is the quotient of total points divided by the total hours taken. Total hours are the number of term hours in which grades are received.*

TABLE III

TABULATION OF THE NUMBER OF TERM HOURS, GRADE POINTS, AND G.P.A. FOR THE INTRAMURAL PARTICIPANTS

Year	Number of Students	Term Hours	Grade Points	G.P.A.
1931–32	37	1,605	2,043	1.272
1932–33	46	2,114	2,611	1.235
1933–34	62	2,693	3,671	1.363
1934–35	78	3,286	4,019	1.223
1935–36	48	2,208	2,875	1.302
Total	271	11,906	15,219	6.395

To be used for purposes of comparison, a second group of 271 students who had *not* competed in intramurals but who paralleled the intramural participants in the five control factors was then found, after a diligent perusal of the Registrar's student files. The scholastic grades of these students were secured also and the G.P.A. for that group was computed, as in the case of the intramural participants. Table IV shows the results.

TABLE IV

TABULATION OF THE NUMBER OF TERM HOURS, GRADE POINTS, AND G.P.A. FOR THE INTRAMURAL NON-PARTICIPANTS

Year	Number of Students	Term Hours	Grade Points	G.P.A.
1931–32	37	1,588	1,941	1.222
1932–33	46	2,104	2,718	1.291
1933–34	62	2,773	3,690	1.330
1934–35	78	3,492	4,010	1.148
1935–36	48	2,191	2,809	1.282
Total	271	12,148	15,168	6.273

As still another group for comparison with the intramural participants, the G.P.A. of the campus "All-Men" group was then secured from the Registrar's office. The results are shown in Table V.

TABLE V

G.P.A. OF ALL MEN ENROLLED

Year	G.P.A.	Year	G.P.A.
1931–32	1.225	1934–35	1.299
1932–33	1.256	1935–36	1.298
1933–34	1.211		
		Total	6.289

* In 1935–36 a change was made in this system of grading. Under the new system an "A" was given the value of 4 instead of 3, a "B" 3 instead of 2, etc. For the sake of uniformity, however, all Grade Point Averages were computed on the old basis of scoring.

THE RESULTS

In summing up the results of this study, Table VI gives a comparison of the grade point average of the three groups considered:

TABLE VI

COMPARISON OF THE SCHOLASTIC ATTAINMENT OF INTRAMURAL PARTICIPANTS, NON-PARTICIPANTS, AND ALL MEN ENROLLED

Year	Intramural Participants	Non-Participants	All Men Enrolled
1931–32	1.272	1.222	1.225
1932–33	1.235	1.291	1.256
1933–34	1.363	1.330	1.211
1934–35	1.223	1.148	1.299
1935–36	1.302	1.282	1.298
Total	6.395	6.273	6.289

The figures in Table VI show that the intramural participants scored a cumulative G.P.A. for the five-year period of 6.395 as compared with 6.273 for non-participants and 6.289 for the "All-Men"; this is a margin of 0.122 over the non-participants and 0.106 over "all-men" group.

The intramural participants show a slightly higher G.P.A. over the non-participants in each year except 1932-1933.

As compared with the "All-Men" group, the intramural participants received a higher G.P.A. in three of the five years.

The average G.P.A., derived by dividing the total number of grade points over the five-year period by the total term hours taken is 1.278 for the intramural participants and 1.248 for the non-participants, again indicating a higher scholastic attainment for those who had participated regularly in the intramural sports program.

CONCLUSIONS

The figures in Table VI show that the intramural program, as it is functioning at the University of Oregon at least, has no deleterious effect on the participant's scholastic attainment. The results of this study corroborate the findings at the University of Michigan and the University of Kentucky. Further study on this problem will undoubtedly prove valuable to the research workers in this field, of which there have been few to date.

A Preliminary Study of Factors in Motor Educability

By C. H. McCloy
State University of Iowa

FOR many years educators have been seeking the keys with which to unlock the problems connected with an adequate measurement of intelligence. Originally these problems were thought to be less complex than they are now known to be. For a long period of time the term *intelligence* was used as though it concerned ability only of the type usually associated with scholastic achievement. It is now known that there are many kinds of intelligence, such as abstract intelligence, concrete intelligence, social intelligence, a kind of intelligence usually called common sense, esthetic intelligence, athletic intelligence, motor intelligence, and a number of others.[19]*

The earliest work in this area was associated with attempted measurements of abstract intelligence, probably because the psychologists studying this field were "book scholars," and hence most interested in abstract intelligence. Among the early important studies of this type were those of Binet, who made very significant contributions over the years 1905–11. These were later refined in the Stanford Revision of the Binet test, first in 1916 and later in 1937. These tests are important for the consideration of the physical educator because of the fact that they developed the method of measuring intelligence or mental age by the number of objective test items passed. These, with the exception of a test of vocabulary, were almost all *pass* or *fail* items. The subject in each case succeeded in passing a test, or he did not. This type of test set the method for investigating motor intelligence a number of years later.[4]

In 1917 Pintner and Paterson[25] published a performance test, which was the first of the non-verbal tests, again being composed of test items or stunts, as it were, which were passed or failed. The advent of America's entrance into World War I added impetus to the mental testing program and produced a non-verbal abstract intelligence test, which was used with illiterates and foreigners—the so-called *Army Beta Test*.

In 1927 Spearman[30] proposed a method of statistical analysis of test items in which he believed it possible to divide tests into two kinds of factors or components. The first kind was a factor common to all of the

Much of the expense of the statistical computations connected with this study was financed by a grant from the Carnegie Foundation for the Advancement of Teaching.

* Refer to numbered Bibliography at end of article.

variables, which he called a general factor. He postulated that all other factors were specific to each variable. This theory was soon found to be untenable for many test batteries as it was found that there were numerous common or group factors in addition to the specific factors. In 1931 Thurstone proposed a method of analyzing for multiple factors. This method has later been refined and published in his *Vectors of Mind*.[31] Others have presented similar methods of analysis, but we shall utilize only the Thurstone method in this presentation.

By means of this method of multiple factors Thurstone has recently (1936)[32] made notable strides in the analysis of abstract intelligence in which he progresses from the attempt to get one general average measurement of this kind of intelligence to a measurement of various factors or components of intelligence. Thurstone finds twelve factors in abstract intelligence* of which he has been able to identify only nine, and only seven of the nine are readily measurable at the present time. The nine are (1) number facility, (2) word fluency, (3) visualization of spatial relationships, (4) memory, (5) perceptual speed, (6) induction, (7) deduction, (8) verbal reasoning, and (9) restrictive thinking. These methods of study are all applicable to the study of motor intelligence and are presented here primarily as historical background.

The earlier theories of intelligence tended to assume that abstract intelligence was an innate, hereditarily-determined quality which could not change appreciably during life. More recent studies, particularly those by Skeels [29] and Wellman,[34] have indicated that abstract intelligence can be markedly developed or retarded by the presence or absence of relevant environmental stimuli. McGraw[21] has shown that this is also true for infants in the field of motor development.

PROGRESS IN MOTOR EDUCABILITY

This progress in the field of abstract intelligence has been intriguing to the physical educator and leads us to make inquiry as to whether comparable progress cannot be made in the various fields of motor intelligence.

In writings and discussions of this problem, the author has chosen to use the term *motor educability*. Intelligence, as such, may be defined as the ability to learn or to adapt oneself to his environment in such a way as to accumulate what we think of as an education. Hence we shall use the term *motor educability* to indicate this type of motor intelligence, and *athletic educability* to indicate the type of educability characterized by what might be called the "smart player" as contrasted with that inept individual who has a perfect genius for doing the wrong thing.

In his study of general motor ability, Brace[4] produced the first important test in the field of motor educability. McCloy[15] attempted to

*Personal communication.

refine the Brace test by removing most of the test variables which had to do only with motor ability, particularly strength, and by adding others which seemed more directly related to motor educability. Johnson[12] added the test which is perhaps the best test of general motor educability we have today, which test was validated in the field of motor educability by Koob.[13] The present author, using Thurstone's method of analyzing for multiple factors, has in the last few years attempted to analyze many of these test variables and has attempted to discover as many as possible of the primary factors in motor and athletic educability. These studies have been conducted in a number of ways: (1) Stunts and test variables of the Brace type and the Johnson type, and various games skills have been analyzed by the method of factor analysis. (2) A number of simple test elements have been studied by correlating them with relatively valid criteria of general motor excellence in which factors of strength and speed have been held constant. (3) A number of elements have been adopted from the studies of others, as in Griffith's studies[10] of peripheral vision, where such a factor has been clearly demonstrated.[4] A few are suggested which are at present not thoroughly confirmed by objective studies but which seem to the author to be confirmed by experience and by other logical considerations. These are in every case indicated by reference 18.

The factor analysis studies, especially those of the Brace type of stunts, have been far too extensive to report here in detail. Hence after briefly discussing the techniques used, we shall simply report the results.

FACTOR ANALYSIS STUDIES

At this point we shall first discuss these various kinds of studies in somewhat greater detail, and later present the results of all the studies in as logical an order as possible.

I. Factor Studies[2,5,7,16,22,35,36]

The factor analysis frequently enables the student to determine the primary factors or components of which a given battery of tests may be composed.[31] Obviously, the results are limited by the test variables analyzed; that is, if some factor which may be present in certain tests of motor educability happens to be absent in the battery of tests analyzed, this factor, of course, will not appear; nor will it appear if present in only one of the tests analyzed: it must be present in at least two variables.

Factors are, in general, uncorrelated. This assumption can usually be validly made for the factors obtained in one factor analysis. Occasionally certain compound or mixed test factors appear as single (oblique) factors, just as in certain chemical combinations the OH radical behaves like a single atom with a valence of one. Such compound factors may be broken down into their elements if proper precautions are taken. "Factors" obtained in one study, however, may

possibly be correlated with factors of slightly different constitution obtained from another study.

Factor studies of continuous test variables, as those found in the Johnson test,[12] are usually much more reliable than those of the stunt, or pass-or-fail, type. This particular kind of variable (the Johnson type), however, is limited in content, and usually not more than two factors of educability appear.[5]

The Brace or stunt type[4, 11, 15] of test variable cannot be analyzed as adequately by this technique. The reliabilities of this type of test element are relatively low, and since they are usually intercorrelated by the tetrachoric method of correlation, the results are not quite comparable to the product moment correlations ordinarily used with the other variables, and the probable errors are larger. Hence the sampling errors will increase, and the results will be less consistent. For research purposes, usually the better procedure is to select stunts that are similar and to combine the scores of several of these, rather than to depend upon the success or failure of one trial in a single stunt. In the factor studies of this type presented here, it has been found rather difficult to interpret some of the results because of this inconsistency, but since we obtained practically the same results in five different studies of the same type,[16] we feel that we are justified in naming certain factors with relative confidence.

II. Test Factors Based Upon Correlations With Other Criteria[1, 3, 4, 11, 13, 14, 15, 23, 26, 27]

These studies have largely been based upon the following types of criteria:

A. Correlations with ratings by competent judges of motor educability or of athletic educability.

B. Correlations of ratings of general motor ability with variables commonly recognized as being associated with motor educability.

C. Studies of speed of learning. In this type of study the existence of a factor as such must be inferred from a logical, but subjective analysis of the correlated variable. Frequently, however, there has been some substantiating evidence from factor analyses.

III. Factors Inferred from the Studies of Others[6, 8, 10, 26, 27, 32]

Some of these are studies in which the nature of the existence of the factor is established by the nature of the variable, as in the studies of peripheral vision. Others will be cited below.

IV. Factors Inferred largely from Subjective Evidence but Not as Yet Supported by Objective Experimentation[18]

We shall now list what we believe to have been found in this series of studies, discussing each under its own heading.

PREREQUISITES TO EFFECTIVE LEARNING

In connection with the various studies, especially with those involving the factor analysis, a number of factors and other items stand out which, while not factors of motor educability as such, might be termed prerequisites to effective learning. These will be listed below with brief comment.

1. *Muscular Strength.*—[7, 11, 16, 20, 22, 36] This stands out in almost all factor analyses of motor variables, and we believe that it is difficult for an individual who does not possess an adequate amount of muscular strength (at least a desirable minimum standard) to learn at an optimum rate. Several studies seem to indicate that strength of arms is especially important.[20]

2. *Dynamic Energy.*—[7, 16] This has appeared in four of six factor studies of the stunt variety. What is meant by the term is that physical constitution or muscular energy which is characterized by the ability to throw oneself into a performance with full vigor. This does not seem to be particularly correlated with strength as such.

3. *Ability to Change Direction.*—[9, 28, 36] In one study, particularly 36, it has been shown that there is such a thing as a factor of *change of direction* which is relatively independent of the strength and speed factors.

4. *Flexibility.*—[7] The ability to learn some types of activities, such as certain tumbling stunts, etc., is dependent upon flexibility of muscles, joints, and ligaments.

5. *Agility.*—[7, 9, 11, 16, 28] This is the ability to move the body rapidly from one position in space to another, involving quick changes of direction. This element probably has much in common with the factor *change of direction* mentioned above in 3.

6. *Peripheral Vision.*—[10] This has been proved by Griffith to be a potent factor in certain types of athletic ability.

7. *Good Vision.*[18]

8. *Concentration.*—[10, 18] The ability to keep the mind on the game and, literally and metaphorically speaking, the eye on the ball.

9. *Understanding of the Mechanics of the Techniques of the Activities.*[6]

10. *Absence of Disturbing or Inhibiting Emotional Complications.*—(Such as fear of water in learning to swim.)

DEFINITE FACTORS IN MOTOR EDUCABILITY

The following are proposed as definite *factors* in motor and athletic educability. Not all of them are uncorrelated each with the other. Some are probably intercorrelated, and some of these are probably partially synonymous with slightly different factors found in other studies of the same abilities. Since they have come from different studies, however, and in these different researches seem to show slightly different char-

acteristics, we have listed them for the sake of completeness, hoping that further studies of the specific items will determine their relatedness or independence.

1. *Insight into the Nature of the Skill.*—[6,7,11,16] This insight may be of different types. In one study[6] it was obviously an understanding of the mechanics of the techniques of the activity. In others[7,11,16] it seemed to be primarily just "catching on to" the nature of the activity in such a way as to learn it more quickly. This may also be related to the item listed under 13*c* below.

2. *Ability to Visualize Spatial Relationships.*—In these studies we have used Thurstone's paper and pencil tests for this ability, and the two studies made show the following results. In one study[23] these test results correlated .778 with football coaches' ratings of the athletic "smartness" of their players. These ratings were made on a five-point scale, which varied from "almost always does the smart thing" to "almost always does the dumb thing." When these test results were combined with a knowledge of the strategy of the game (a multiple choice questionnaire), a multiple correlation of .898 was obtained.

The second study[1] was a correlation of this ability to visualize spatial relations, measured by the same tests, with ratings of two types: (1) Judgments by the instructors of the sports abilities of high school girls. In this case, *r* equals .510. (2) Ratings of the athletic intelligence of high school girls in sports in general; *r* equals .522. Incidentally, this same quality of visualizing spatial relations correlated .342 with the Iowa Revision of the Brace test,[15] and .527 with the Johnson test.[12] It seems to be an extremely important factor in the field of motor and athletic educability.

3. *The Ability to Make Quick and Adaptive Decisions.*—This might be thought of as psycho-motor response speed. In one study[1] a test was devised which required the subject to respond as rapidly as possible to a quickly changing series of events. The correlation with general motor sports ability of high school girls was .527, and with athletic educability or smartness, .367. A similar test has been devised by Seashore[27] but has not been studied from this point of view. Griffith (C.R.)* reported similar results with a more ambitious test.

4. *Sensory Motor Coordination I.*—This is the coordination of eye with head, hand, or foot, and is particularly seen in relation to the heading, catching, striking, or kicking of balls. It has been found in one factor analysis,[35] and in another study[27] it has been shown to be correlated with motor ability. Wendler found a correlation of this factor with the sum of several baseball test scores of .67, with fielding flies in baseball, .58, with catching a soccer ball,..48, and with batting, .40.

5. *Sensory Motor Coordination II.*—This type of sensory motor coordination is the adaptation to weight and force.[18] It is illustrated by

*Personal communication.

what happens when an individual catches a tossed ball which he thinks to be a twelve-pound shot but which turns out to be an indoor baseball, or the type of thing that happens when one lifts a suitcase that he thinks to be heavy and finds that it is empty. It is the adaptation of force to resistance or weight. This type of ability in its more refined forms probably accounts for much of the accurate response which is responsible for good form in motor performance.

6. *Judgment of the Relationship of the Subject to External Objects (whether inanimate objects or people) in Relation to the Following.*—(a) time,[35] (b) height, as in catching flyballs,[35] (c) distance,[2,35] and (d) direction.[18] These elements are all of the kind that are related to such activities as "leading" another individual in passing a ball, in judging flyballs or line drives in baseball, and in judging a thrown ball in batting or in catching forward passes. The evidence is not clear as to whether each of these is a factor in itself or whether they are combined in a minor Gestalt. The evidence for their being different is largely experimental; for example, many throwers of balls throw accurately, so far as direction is concerned, even in leading the receiver, but they may make mistakes in the height at which they throw the ball in their effort to make it, after being pulled downward by gravity, reach the receiver at the proper height. Others whose errors of height are negligible make errors of direction and time.

7. *Accuracy of Direction and Small Angle of Error.*—[33] Voigt experimented with a light gun in which a beam of light struck a target constructed of ground glass. The place at which the target was struck by the light beam was marked by an assistant standing behind the target. It was found that the size of the error, which should increase directly with the distance from the target, did not increase this rapidly. In other words, the angle of error was reduced as the shooter stood farther away. The present author found that the same thing was true in shooting baskets in basketball. The errors at thirty-five feet are not proportionately as great as are the errors at twenty feet.[17] The present author also has found that, when practicing over a season, any given individual appears to improve only to a certain point, and the degree of accuracy possible with one individual is apparently not possible with all others. Further evidence to substantiate this was offered by Oliphant.[24]

8. *General Kinesthetic Sensitivity and Control.*—This is the sort of thing that is apparently governed by muscle-joint-sensory proprioceptive mechanisms. This matter is adequately discussed in almost any of the larger physiologies. Further evidence has been brought to bear upon this particular item in connection with balance by Bass.[2] (See 12*d* below.)

9. *Ability to Coordinate a Complex Unitary Movement.*—[4,8] This type of coordination is seen where an individual does a complex activity in which several parts of the body function in different ways at the same

time. This type of thing ranges all the way from such party stunts as that of patting the head and rubbing the abdomen at the same time, to activities like a back somersault with a full twist and the complicated movements of the eurythmics of Dalcroze.[8] This type of activity apparently requires a different type of learning than the next one described. The Brace test type of stunt is usually of this type.[4,15]

10. *Ability to Coordinate a Complex Series or Combination of Movements Which Follow One Another in Rapid Succession.*—This type of activity may be illustrated by such as the pole vault, the pivot and dribble in basketball, or a round off, back hand spring, and back somersault in tumbling. Most of the test variables of the Johnson test[12] fall under this category.

11. *Arm Control.*—[7,16,18] The successful execution of many activities seems to depend upon the control of the arms. This is illustrated by many tumbling and diving stunts, particularly those involving twister exercises, but is also illustrated by the use of the arms in jumping and balance.

12. *Factors Involved in the Functions of Balance.*—[2,7,11,16]

a) The general contribution made by the eyes to balance. Bass found that there was a vast difference in any balance exercises between doing it with the eyes opened and with the eyes closed.[2]

b) The use of the eyes in balance, where the movement involved is forward and backward, such as balancing crosswise on a narrow beam.[2] This factor may be one involving accommodation or convergence of the eyes which would imply an accuracy of discrimination in the proprioceptive sense organs in the muscles controlling the eyes.

c) The use of the eyes in balance which involves motion sidewise.[2] This is illustrated by balancing on a narrow beam running lengthwise of the feet. It may be a function of a change of the head angle in relationship to the vertical plane, or it may be related to a parallax effect. Further study is needed on this subject.

d) Kinesthetic sensitivity and control in balance.[2] This is probably the same as 8 above.

e) The balance function of the two vertical sets of semi-circular canals.[2] These two sets of canals seem to function together and in forward, backward, and sidewise motion.

f) The balance function of the horizontal semi-circular canals.[2] This type of sensitivity is involved largely in exercises where the head rotates in a horizontal position or in the plane of the horizontal set of canals, such as the pirouettes or spinning in the dance or skating, in balance stunts on a narrow beam running lengthwise of the foot where the body is bent forward 90 degrees, and in similar activities.

g) "Tension giving reinforcement."[2] Bass found a factor that was common to all balance activities when the subject was standing on a very narrow beam, which was not present when the subject was standing

on the floor. She interpreted this to be the result of a heightened sensitivity of the balance mechanisms brought on by the increasing tension on the sole of the foot. This needs further confirmation.

13. *Timing.*—Timing apparently involves several types of response for which eventually we should probably have more than one term.

a) The eye-motor type of timing. This is probably related to the *sensory motor coordination I* given above under 4.

b) A kind of timing that might be thought of as being characterized by a feeling for duration of time. This is illustrated by the timing of an apparatus exercise, such as the upstart on the horizontal bar where the intervals between parts of the activities must be exactly timed. This may be related to motor rhythm (14*b* below).

c) The present author believes that there is a kind of timing that might be referred to as "insightful timing." This is the kind of timing in which the individual does it properly with minimum practice because he understands the activity. This may be a combination of the understanding of the mechanics of the activity (see 9 above under prerequisites), factor 1 under insight, and 13*b* under this heading.

14. *Motor Rhythm.*—[3, 15] Blix, studying gymnastic ability, found a correlation of .42 between the Seashore test of motor rhythm[27] and ability to perform in apparatus work and tumbling. Others have found that there is a rhythmical element to success in the Koerth pursuit test in the Seashore battery,[27] and Blix found a correlation of .41 between this ability and gymnastics.

Lemon[14] found a correlation of .46 between the Seashore motor rhythm test and a practical test of rhythm in dancers. This type of motor rhythm may be partly synonymous with timing (13 above), and there seem to be two types: (a) One may be called the "beat type" in which the individual can keep step or maintain a constant rhythm. (b) This is the type of motor rhythm exhibited in apparatus work (see also 13*b* above) in which the individual reacts at the rhythmical time intervals necessary to success in the performance.

15. *Sensory Rhythm.*—[3, 14, 26] Much work has been done in this field in connection with tests of musical talent.[26] So far as applications to physical education are concerned there seem to be the following items: (a) A feeling for beat or regularity of interval. This would be related to 14*a* as the sensory function is related to the motor function. (b) What might be spoken of as a harmony of rhythmical feeling—knowing when it is right. When it is not, one feels a "rhythmical discord," as it were. (c) A feeling for the proper timing. This again would be related to 13*b* and 14*b* as the sensory function is related to the motor function. (d) A feeling for interval or duration.[26] (e) A feeling for stress or intensity.[26] Lemon, [14] using the Seashore tests[26] for the sense of rhythm, obtained a correlation of .46 with a practical rhythms test, and a multiple correlation of .61 between the sensory and the motor rhythm test and the

practical test of rhythm (not available in Lemon's study but computed from her data).

16. *Esthetic Feelings.*—[18] In physical activities, as in many other fields of art, some individuals have a greater feeling than do others for pure perfection of movement, as in the dance, in diving, in the golf swing, and in many other activities. No attempt is made to analyze this ability here. It may be a compound of a number of others, or there may be a number of sub-factors. We believe it sufficiently important to be recommended for further study and analysis.

THE NEED FOR FURTHER RESEARCH

The list of probable factors in motor educability presented here shows the need for much further research. It is presented in this preliminary form primarily to stimulate such further study. Just as the measurement of abstract intelligence has achieved its present status as the result of studies conducted over a period of thirty-five years by dozens of laboratories and competent students, and is only now beginning to differentiate between specific factors of abstract intelligence, so we believe that it will take many years of careful study by research students in many of our laboratories to refine, add to, and eliminate from, this list of factors, and to learn to measure them accurately. It would seem to the author that the next steps should be, specifically:

1. To see whether some of these factors as here presented should not be further divided. It is believed that this may be true of factors 1, 2, 3, 4, 6, 8, 10, 13, 14, 15, 16.

2. To see whether some are not perhaps the same masquerading under different disguises and found in different company. This may be true of, particularly, 13, 14, 15, and of 8 and 12*d*.

3. To attempt to devise tests for each of these in its relatively pure form and to explore the possibilities that each may make at each of the important age levels.

4. To discover which factors are related to each important type of physical education activities.

5. After this stage in the relatively pure science research in motor educability has been reached, to attempt to devise simple and successful ways to measure the more practical and important factors, and to put some of these tests into batteries. The first four of these stages will be stages of complication and detailed exploration for purposes of scientific understanding. This fifth stage is the stage of simplification—to adapt our tests for practical usage.

6. To explore the relationships of these factors of motor educability to other important life activities in industry, the professions, etc. At this stage we might well attempt to cooperate with students of engineering and other professional groups. The author feels that, if an ade-

quate battery of tests of this type is developed, it may be possible to measure these abilities in all pupils at about the beginning of the junior high school, and on the basis of the results to advise more intelligently as to the program to be elected. To give one illustration, an individual may be badly lacking in ability to control his angle of error (factor 7) but be almost perfect in timing and motor rhythm (factors 13 and 14). Because of his inaccuracy he may never be able to play a satisfactory game of golf but because of the larger margin of error permitted, he may become exceedingly expert in badminton or tennis. Where golf might provide him with a soul-disturbing irritant for his middle age, badminton or tennis might provide him with the satisfactions that go with a thorough mastery of some skill, and the physical educator might be well advised to take such test results into account.

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Status of Physical Education in Elementary Schools

By Alexander Georgiady
Jefferson Elementary School, Manitowoc, Wisconsin
and Russell Savage
Madison Elementary School, Manitowoc, Wisconsin

THE general purpose of this study is to gain a composite picture of physical education in the elementary schools. The immediate purpose is to compare the status of physical education in a city of 25,000 [1] with the nation at large. Since physical education is recognized as an integral part of the progressive elementary school program, we should be aware of the trends in the administration and organization of the activities which comprise the program.

If this study will better acquaint those within the profession with the status of physical education in elementary schools, its purpose will have been fulfilled.

METHOD AND PROCEDURE

One hundred and seventy-five questionnaires [2] were sent to schools selected from the *Elementary School Principals Yearbook*.

This study reports the results in 93 elementary schools located in towns and cities varying in population from 700 to over 1,000,000, representing 43 states and the District of Columbia. According to the figures presented by the principals, the average number of classrooms in the schools was 14 and the average number of teachers on each faculty was 14. Returns also indicated that the size of the schools ranged from 4 rooms and 4 teachers to 54 rooms and 54 teachers.

DATA AND DISCUSSION

Table I shows that in over 21 per cent of the schools reported, activities involving competition between boys alone was the leading item. Slightly more than 20 per cent of these same schools reported activities involving only girls.

Intramural and interclass activities were reported more frequently than interscholastic activities. Activities involving either boys alone, or girls alone, were more common than activities involving mixed groups.

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1 Manitowoc, Wisconsin.
2 See questionnaire in appendix.

TABLE I
TYPES OF PHYSICAL EDUCATION ACTIVITIES IN NINETY-THREE ELEMENTARY SCHOOLS

Type	Frequency	Per Cent
Boys vs. boys	72	21.8
Girls vs. girls	68	20.6
Interclass	53	16.1
Intramural	43	13.0
Boys and girls vs. boys and girls	40	21.8
Interscholastic	33	10.0
Boys vs. girls	21	6.4
Totals		100.0

Table II reveals the fact that classroom teachers were responsible for the organization of the physical education program in most of the schools and in over 37 per cent of the cases were expected to organize the program; while in almost 30 per cent special supervisors had this same responsibility. Table II illustrates these results.

In this study, "classroom teacher" is defined as one engaged in regular classroom work other than physical education. In some cases, more than one individual shared the responsibility for organization.

TABLE II
RESPONSIBILITY FOR ORGANIZING THE PHYSICAL EDUCATION PROGRAM IN NINETY-THREE ELEMENTARY SCHOOLS

Individual	Frequency	Per Cent	Individual	Frequency	Per Cent
Classroom teacher	45	37.8	Principal	14	11.8
Special supervisor	35	29.4	Others	1	.8
Athletic director	24	20.2	Totals	119	100.0

It is noted that every school reported that both boys and girls participated in the program. Nearly 50 per cent of all schools had the pupil participation at grade levels; while pupil participation at ability levels and mixed levels disclosed an equal number of cases: 37 each, or slightly more than 25 per cent of the total for each.

The gymnasium or gym period was used for the program in approximately 24 per cent of the cases, while 22 per cent used the afterschool period; about 20 per cent used the recess period; over 16 per cent the noon-hour period. The morning preschool period was used by over 11 per cent of the schools, while about 6 per cent used week ends for activities in their programs.

Sixty-five per cent of the schools have a daily program, 13 per cent a semi-weekly program, 12 per cent a thrice weekly program, and 6 per cent a four times weekly program with only 3 per cent having a program that was active but one day of the week.

It appears that the entire faculty supervises or guides the program in 37 schools making up over 20 per cent of all schools in this study. A

special supervisor carries out this function in 33 cases or nearly 19 per cent of the total. In almost 18 per cent of the cases, a woman teacher assumes responsibility for the guidance of the girls; while in nearly 17 per cent of the cases a man teacher assumes the task of guiding and supervising the boys. A single teacher guides the entire program in over 11 per cent of the cases reported; a man teacher guides both boys and girls in nearly 7 per cent of the schools. Joint pupil and faculty supervision was reported in 12 schools or 7 per cent of the total. Only 2 schools reported that pupils alone were allowed to guide and supervise their own program.

Over 21 per cent of the schools devoted more than 5 hours weekly to physical education as contrasted to less than 2 per cent that devoted only one hour weekly. Two hours weekly was second in frequency in this study, reported by 12 schools, 20 per cent of the total. Of the 61 schools that reported their weekly time allotment for physical education activities, two and one-half hours was found to be the median weekly time allowed.

Nearly 90 per cent of all the schools reporting include softball in their program. Baseball was reported by only 16 per cent of the schools. Table III contains the results found in the reports of 93 elementary schools. Low organized games were interpreted to be those games that require little practice before actual participation, such as: dodgeball, guard the pin, pin snatch, black and white, prisoner's base, etc. This group was reported 76 times for a percentage of over 81. Quiet games

TABLE III
ACTIVITIES IN NINETY-THREE ELEMENTARY SCHOOLS

Activity	Frequency	Per Cent	Activity	Frequency	Per Cent
Softball	83	89.2	Horseshoes	6	6.45
Low organized games	76	81.7	Individual combative sport	5	5.37
Volleyball	68	73.2	Singing games	5	5.37
Basketball	57	61.3	Chess	4	4.30
Football (touch)	53	57.0	Wrestling	4	4.30
Quiet games	51	54.8			
Track and field	47	50.6	Darts	3	3.22
Gymnastics	40	43.1	Ice Hockey	3	3.22
Soccer football	37	39.8	Tenniquoit	3	3.22
Tumbling	34	36.6	Field hockey	2	2.15
Table tennis	18	19.3	Ice skating	2	2.15
Handball	16	17.2	Box shinny	1	1.07
Checkers	16	17.2	Golf	1	1.07
Baseball (hard)	15	16.1	Individual stunts	1	1.07
Dancing	13	13.9	Lawn tennis	1	1.07
Badminton	11	11.8	Paddle tennis	1	1.07
Football (tackle)	11	11.8	Posture	1	1.07
Marbles	11	11.8	Shuffleboard	1	1.07
Boxing	10	10.7	Swimming	1	1.07

include those games that are used in the class room, the small game room, or other small areas. This would include all blackboard and seat games. Fifty-one, or over half the schools, reported this type of activity. Games that were reported by only one school were usually of the type that required special facilities not found in most elementary schools, i.e., golf, tennis, swimming.

From a study of the figures received, it became apparent that boys and girls used the same gymnasium in 43 schools. In 23 of these schools, the gymnasium was used by both boys and girls at the same time. Seven schools indicated that boys had their own gymnasium, while 6 schools reported having a separate gymnasium for girls. There were only 2 schools that separated their gymnasium by using a curtain.

It was noticeable also, that gravel is the most common type of playground surface. Forty-two schools, or exactly 31 per cent of the total, had this type of playground surface. Slightly more than 23 per cent reported grass surfaces. Twenty per cent reported having a clay surface, and 11 per cent reported having either a sand surface or an asphalt surface.

Eighty-seven schools out of the entire group of 93 reported on the size of their playground as compared to the size of their building. Seventy-nine of these schools reported a playground larger than the size of their building, as compared to 8 that reported a playground smaller than their building. As far as equipment for outdoor use on these playgrounds is concerned, swings, outdoor basketball courts, volleyball and tennis net poles, jumping pits, and horizontal bars are the more common types. Table IV reveals the results of this phase of the survey.

TABLE IV
PLAYGROUND EQUIPMENT IN USE BY NINETY-THREE ELEMENTARY SCHOOLS

Type	Frequency	Per Cent	Type	Frequency	Per Cent
Swings	42	45.2	Slides	26	27.9
Outdoor basketball court	39	41.9	Horizontal ladders	14	15.5
Volleyball and tennis net poles	37	39.8	Jungle gym	14	15.5
Jumping pits	34	36.6	Giant striders	12	12.9
Horizontal bars	31	33.3	Vertical ladders	12	12.9
Teeter boards	30	32.2	Merry-go-round	10	10.7
Sand boxes	26	27.9	Traveling rings	8	8.6
			Vertical poles	8	8.6
			Stationary rings	7	7.5

Table V indicates that softballs (baseball), basketballs, volleyballs, bats, volleyball and tennis nets, footballs, and soccer balls, were mentioned by over 50 per cent of the schools as being included in their athletic and physical education equipment supply. Tumbling mats and tennis rackets were mentioned by the least number of schools, which in

this case was one for each. Table V contains the results of the survey with regard to this phase.

TABLE V
ATHLETIC EQUIPMENT USED BY NINETY-THREE ELEMENTARY SCHOOLS

Type	Frequency	Per Cent	Type	Frequency	Per Cent
Softballs	79	85.0	Table tennis paddles	15	16.1
Basketballs	67	72.1	Table tennis balls	14	15.0
Volleyballs	67	72.1	Badminton racquets	13	14.0
Bats	65	69.8	Badminton shuttlecocks	12	12.9
Volleyball and tennis nets	63	67.7	Tennis balls	11	11.8
Footballs	50	54.7	Rubber playground balls	9	9.6
Soccerballs	48	51.7	Chess boards	4	4.3
Pins (for bowling)	23	24.7	Tumbling mats	1	1.1
Hard baseballs	19	20.4	Tennis racquets	1	1.1

Of the schools reporting the data in Table V, 40 felt that the equipment cost was a barrier to the improvement of their program, as compared to 33 schools that felt that cost was not a barrier. It is worthy of notice here that some of the schools reporting that cost was not a barrier to their program, showed only meager equipment for the improvement of their programs.

Sixty-nine of the 93 schools gave some kind of awards to the pupils. Twenty-one, or over 30 per cent of the total, gave points; 15 or over 21 per cent of the total, gave letters; and 14, or nearly 21 per cent, gave ribbons. Emblems, medals, trophies, banners, and shields were given in the frequency order named. Twenty-four schools gave no awards of any kind. Apparently these awards were given out most frequently on the basis of participation. Forty per cent of all awards were given by this method, as compared to nearly 39 per cent that used excellence of performance as a criterion, or 21 per cent that used interest as a basis. In over 71 per cent of the cases reported, the classroom teacher in charge of the physical education program determined who was to receive the awards. In the remaining 28 and a fraction per cent of the cases, a committee of classroom teachers and pupils acted as the determining body of control in giving recognition through awards.

Eighty-four schools indicated whether or not they correlated their physical education program with some other phase of the curriculum. Forty-three of these schools reported that they did practice some correlation while the remainder, 41, stated that the program was not correlated with other subjects. Health was the subject most frequently used for correlation. Thirty-eight per cent of those schools correlated physical education with the subject known as "health." The social studies were named by over 25 per cent of the schools and music was named by nearly 9 per cent. The remaining subjects reported were of low frequency

in the following order: safety, all subjects, science, English, art, dancing, arithmetic, and biology.

Only 22 schools reported that their program was correlated with some civic observance or with the program of some civic or community organization. Health Week, Safety Week, Fire Prevention Week, P.T.A. programs, playdays of the community, May Day, Book Week, and Boy Scout Week were those mentioned.

It was attempted to learn the reactions in regard to the particular programs of the various individual cooperating in this study. The objective was to discover the weak and the strong points in regard to the various systems of physical education programs carried out in the schools reporting in this survey. Table VI contains the comments received from the various schools concerning strong points. As might be expected, the two most frequent comments were: one, that the lack of necessary equipment and funds retarded the program; two, that the lack of properly trained teachers retarded the program. The points of weakness showed such wide range and were of so little frequency that they lacked definite meaning, and therefore are not included.

TABLE VI

COMMENTS FROM FACULTY MEMBERS OF NINETY-THREE ELEMENTARY SCHOOLS REGARDING THE WEAK POINTS OF THEIR PHYSICAL EDUCATION PROGRAMS

Comment	Frequency
Lack of necessary equipment and funds	27
Lack of properly trained classroom teachers	15
Program is inadequate	5
Participation of both sexes at the same time is undesirable	3
Athletics are over-emphasized	3
Lack of variety in activities	3
Man instructor needed for boys	3
Miscellaneous (14 different) comments	16

SUMMARY AND CONCLUSIONS

The results of this study may be summarized by the following general statements:

1. Separate activities for boys and girls are more common than activities with mixed groups.
2. Intramural and interclass activities are more widely in use than are interscholastic activities.
3. Classroom teachers are the individuals most often expected to organize the physical education program.
4. Apparently all schools include programs for boys and girls.
5. Pupils participate on a grade level.
6. The program of physical education is carried on daily.
7. In most cases the entire school faculty carries out the supervision of the program.
8. Over half of the schools studied allow two and one-half hours or more per week for the program.

9. Softball, low organized games, volleyball, basketball, touch football, and quiet games, are the most popular activities.

10. Schools having gymnasiums indicate that the more common practice was to allow both sexes to use the gym at different intervals.

11. Gravel surface is most commonly found on playgrounds.

12. Most elementary school playgrounds are larger than the area used for the school building proper.

13. Swings, outdoor basketball courts, volleyball and tennis net poles, jumping pits, horizontal bars, and teeter totters are the most common types of playground equipment.

14. Softballs, basketballs, volleyballs, bats, volleyball and tennis nets, footballs, and soccer balls are the most common types of athletic equipment used by the elementary schools of this study.

15. Most schools feel that the cost of equipment is a barrier to the improvement and extension of their program.

16. Most schools give points or letters for awards on the basis of participation and excellence of performance as determined by the faculty member in charge of the physical education program.

17. Slightly more than half of the schools correlate their programs with school subjects, among which health and social studies are most frequently used. Few schools correlate their program with civic observances or organizations.

18. Most individuals directly connected with physical education programs in elementary schools feel that their programs suffer because of the lack of necessary equipment, funds, and properly trained classroom teachers.

Pure Speed as a Positive Factor in Some Track and Field Events

By James W. Coleman
University of Nevada

THE PROBLEM

EXPERT opinion on the contributing factors in track and field performances in the past and at present has varied widely. Because of this fact, we are decidedly handicapped in our efforts to introduce into the daily practices the best methods and ideas. In recent years, however, there has been an increasing tendency to analyze performance and to discover, objectively and scientifically, the factors involved. This study represents another effort on the part of the author to contribute some additional data and findings on this subject in the hope that the information already available and that which will be discovered in the future will help to formulate more definite and valid conclusions. The specific purpose of this investigation is to study the data at hand experimentally by the best known methods and to discover, if possible, some of the factors that control performance in these events, the relationships these factors have to each other, if any, and the relative importance of each; also to set up a series of tests that will predict with as high a degree of accuracy as possible the latent ability of any given individual in the events involved. It is believed that the tests selected are composed of elements which have definite and clear-cut methods of administration, are as economical of time and equipment as possible, and have been proven to be valid, reliable, and objective.

Seventy-five university men from the Sophomore Class of the University of Nevada, ranging in age from 18 to 24 years, were tested in the events used. During their freshman year in the University, each of these men had six weeks of instruction and practice in each of the following: mass games, tumbling, heavy apparatus, basketball, track and field. The men were selected entirely on the basis of what was believed to be their physical fitness as shown by their physical and medical examinations, and by strength tests given annually by the university physician and the members of the staff of the Physical Education Department at the beginning of the fall semester.

Before taking the tests each man was given at least six hours of instruction and practice, in one-hour periods, in each of the events here involved. These tests were administered on a competitive basis, because this method gave each man an added stimulative incentive to do his best. The results of each test were posted where the contestants could

see them, and this proved to give an added interest and stimulated greater effort. Each individual took each and every test twice for the purpose of determining reliabilities, with the exception of weight, height, and the strength test, which were taken three times as follows: at the beginning of the fall semester and at the end of the fall and spring semesters.

ADMINISTRATION OF TESTS USED

The Strength Index, hard baseball throw for distance, one-, four-, and sixteen-pound shots, the sixty-yard dash, standing and running broad jump, running high jump (scissors form), body weight in pounds, and height in inches made up the series of events or tests used, eleven items in all. Competition in the motor performances was held in one event at a time.

The one-, four-, and sixteen-pound shots were put from a standing position in the front of the circle without the travel across the ring, with the shot held down at the base of the fingers. This method was used because it was quickly learned by all, and it seemed more nearly to equalize the novice and the experienced shot-putters and to minimize the factor of finer skill, thereby aiding to standardize the test. Each man put the shot of each weight three times after a reasonable warm-up period and on each of two separate days, that is, a total of six puts for each weight of shot, and all puts were recorded for each day, with the first and second day's results being kept separate. In making the measurements of each put, the closest even inch was taken as the official distance. All competition in one weight of shot was completed before another was started.

The regular five-ounce hard baseball was thrown for distance; and for the purpose of standardizing the throw, two parallel lines were drawn six feet apart. This method enabled each contestant to take a short hop as an aid in throwing. Standing between these two lines, each individual was given three throws after a reasonable warm-up period on each of the two separate days, six throws in all. All three throws were recorded as the record of each thrower each day, with the throws being recorded to the nearest foot.

Each man was weighed and his height taken and recorded as a part of the examination and testing program at the beginning of the first semester and at the end of the first and of the second semesters.

The strength test used was the Iowa Revision by C. H. McCloy[1] of the Rogers' Strength Index,[2] which is the sum of the unweighted strengths of the right hand grip, the left hand grip, the back lift, the leg lift, and the weighted dipping and chinning strengths. This test was used as a measure of total strength of each individual and was

1 C. H. McCloy, *Tests and Measurements in Health and Physical Education* (New York: F. S. Crofts & Co., 1939).

2 F. R. Rogers, *Physical Capacity Tests* (New York: A. S. Barnes and Co., 1931).

recorded in pounds. The right and left grips, the back and leg lifts were administered according to directions given by Rogers. The dipping and chinning strengths were scored by methods presented by McCloy. Each individual took these tests three times, as stated above.

On two occasions, separated by a lapse of three days, each individual ran the sixty-yard dash three times, with a ten-minute rest period between each race. Each race was for the full sixty yards, with two men running in each race to provide ample competition. One-tenth second stop watches were used, and one watch was held on each runner. The watches were started on the smoke of the starter's gun and stopped as the contestant reached a well marked finish line. The times were recorded in seconds and tenths of seconds. Each runner ran a total of six races in the two days.

The running broad jump was conducted under the official rules governing the event. On Monday each man took three jumps and on the following Wednesday three more. All three jumps of each day were recorded to the nearest inch.

The scissors form of the running high jump was used for the purpose of better standardizing the event. It was conducted under the official rules. The last height a man cleared was recorded as his record for the first day, and on the second day the same procedure was followed.

In the standing broad jump each contestant stood with the edge of the toe of his shoes even with the front edge of the take-off board. Measurement was made from the front edge of the take-off board to the point where the ground was broken closest to the board. The measurements were recorded to the nearest inch.

RELIABILITIES AND INTER-CORRELATONS OF TESTS USED

For the purpose of establishing the reliabilities of the baseball throw for distance, one-, four-, and sixteen-pound shot-puts, sixty-yard dash, standing broad jump, and the running broad jump, the averages of the three trials of the first day were correlated with the averages of the three trials of the second day in each event, that is, each event was correlated against itself. In the case of the Strength Index, the two best records of each man were correlated to establish the reliability of the Strength Index. In the running high jump, the height jumped the first day was correlated with the height jumped on the second day. In the cases of the weight and height, it was deemed not necessary to compute reliabilities because of the accuracy of accepted methods in making these measurements. The coefficients of reliability are given in the diagonals and enclosed with parentheses in Table I.

The average of all six trials in the one-, four-, and sixteen-pound shot-puts, baseball throw, running and standing broad jumps, and the sixty-yard dash were used as the records in the inter-correlations. In the case of the running high jump, the average of the height jumped

on the first and second days was used. In the cases of weight, height, and strength, the average of the three records in each variable was used. The results of these eleven inter-correlations are shown in Table I.

TABLE I

	Weight	Strength	Height	16-lb. shot-put	4-lb. shot-put	Baseball throw distance	Running high jump	1-lb. shot-put	Running broad jump	Standing broad jump	60-yd. dash
Weight	(1.00)	.751	.564	.531	.378	.267	.143	.160	.152	.086	−.160
Strength	.751	(.912)	.392	.367	.316	.212	.482	.132	.114	.214	.201
Height	.564	.392	(1.00)	.191	.157	.045	.215	.342	−.032	.157	−.119
16-pound shot-put	.531	.367	.191	(.925)	.727	.560	.433	.391	.423	.348	.400
4-pound shot-put	.378	.316	.157	.727	(.911)	.469	.329	.608	.440	.296	.454
Baseball throw dist.	.267	.212	.045	.560	.469	(.821)	.175	.549	.478	.050	.444
Running high jump	.143	.482	.215	.433	.329	.175	(.895)	.349	.341	.366	.240
1-pound shot-put	.160	.132	.342	.391	.608	.549	.349	(.898)	.563	.565	.450
Running broad jump	.152	.114	−.032	.423	.440	.478	.341	.563	(.830)	.282	.547
Standing broad jump	.068	.214	.157	.348	.298	.050	.366	.565	.282	(.958)	.336
60-yard dash	−.160	.201	−.119	.400	.454	.444	.240	.450	.547	.335	(.842)

MULTIPLE FACTOR ANALYSIS

These data were further analyzed by a multiple factor analysis of the inter-correlations shown in Table I. The method and procedure followed in making this analysis is clearly set forth by Thurstone.[3] In the center of gravity method of factor analysis, the "Factor Loadings" obtained in the first analysis do not represent the true correlations with these factors. The planes must be "rotated."

TABLE II
ROTATED FACTOR LOADINGS

Variables	Factor I Pure Strength	Factor II Pure Speed	Factor III Height	Factor IV Dead Weight	Hypotenuse
Weight	.663	−.025	.059	.630	.917
Strength	.949	−.020	−.020	.004	.949
Height	.364	−.180	.509	.367	.748
16-pound shot-put	.483	.611	−.014	.364	.860
4-pound shot-put	.288	.644	.203	.409	.841
Baseball throw	.205	.664	−.104	.241	.743
Running high jump	.484	.267	.253	−.155	.629
1-pound shot-put	.124	.652	.602	.063	.899
Running broad jump	.197	.661	.158	−.087	.713
Standing broad jump	.194	.317	.575	−.181	.708
Sixty-yard dash	.159	.758	−.050	−.334	.845

[3] L. L. Thurstone, *The Vectors of the Mind* (Chicago: University of Chicago Press, 1935).

In performing these rotations, the factors are plotted each against the other in terms of angular relationships. These plots are then rotated successively until a simple and clear configuration results. The following table of "rotated factor loadings" was obtained.

The factors shown in Table II correspond to zero order correlations with the four factors. The problem of identifying the factors was next in line. With careful inspection of the factor loadings shown in Table II, and of the plotted factor loadings, it seems rather clear that Factor I is *strength*. It can be seen that weight and the Strength Index are very high in this factor, and is what should be expected if this factor is strength. Upon close inspection of Factor I of Table II, it is rather apparent that the assumption of strength is consistent with the facts found therein, and in this connection it is interesting to note, and call attention to the fact, that the Strength Factor I in its relation to the various weight shots and baseball throw increases straight through to the 16-pound shot put. This would seem to support the idea that this factor is strength.

The second factor seems to be pure *velocity* or *speed*. This factor was thus identified due to the fact that in mechanics it is a well known fact that *power* is the main element in many of the variables or events herein used, and power is composed of force and velocity. By close inspection of Velocity Factor II in Table II, it will be apparent that this factor decreases in its relation to the various weight shots as they increase in weight. This would seem to support the idea that this factor is velocity or speed. The high relation shown between the 60-yard dash and the running broad jump with this factor seems to be final proof of the speed identification.

Factor III is assumed to be *height*. This assumption is based on the .509 correlation shown between this factor and the variable height. It is true that this factor loading is relatively low with height and it has a respectable factor loading with most of the throws and the standing broad jump. However, in view of the fact that this factor is not highly correlated with the baseball throw as would be expected in light of the other throws, I have tentatively attached the term, height, to it. Positive identification will have to await another study.

Factor IV is identified as *dead weight*. This assumption is based, first on the noticeable negative correlation with the 60-yard dash, which is consistent with the facts found in column one of Table I, where weight shows a negative correlation with the 60-yard dash. In the second place it is evidenced by the increasing correlations between this factor and the various weight shots as they increase in weight, and finally by the high relation between this factor and the variable weight.

By the way, weight may be divided into "live weight," or weight that is muscular, and "dead weight," or that part of the body's weight that makes no contribution toward strength. The first is measured by the *Strength Factor* and the second by the *Dead Weight Factor*.

Column five in Table II gives the hypotenuse, and indicates just what proportion of the total of each of these variables these factors were able to measure. The hypotenuse is found by taking the square root of the sum of the squares of the four factors. In studying the factors above, it is necessary to keep in mind that they were obtained through a factor analysis and are unrelated and uncorrelated with each other. That is, Factor I is unrelated to Factor II and so on for the four. These factors are unrelated to each other in about the same way that chemical elements of a compound are unrelated: that is, if you break a chemical compound down into its elemental components and these elements are taken separately, one has no relation to the others except the property of being able to unite with the others. Factors found through factor analysis are to be accepted in much this same light. The factors identified in this problem are unrelated to each other in any way excepting the property of union one with the others in the proportions shown above to produce the activities used in the problem. The total amount of each activity thus measured is indicated in the column marked hypotenuse, and is evidence that the four factors do not measure the whole of any one of the events indicated. Therefore, it is evidence, for example that the tests used here do not measure everything involved in putting the sixteen-pound shot, and so on.

The hypotenuse may be proven to be the multiple correlation of the variable with the four factors. It is interesting to note that this multiple correlation approaches the reliability in the *simpler* of the motor events, but falls short in those requiring more *skill*—a factor not measured in this study.

PARTIAL AND MULTIPLE CORRELATIONS

A final analysis of these data was made by computing partial and multiple correlations in the combinations that follow below, and the correlation coefficient is given with each combination.

The running broad jump can be predicted to a multiple correlation of .879 by making use of the Speed Factor, strength, height, and weight.

The 60-yard dash can be predicted to a multiple correlation of .898 by using the Speed Factor, weight, running broad jump, and height.

The Speed or Velocity Factor can be predicted to a multiple correlation of .919 by combining the 60-yard dash, baseball throw for distance, the 4-pound shot-put, and the Strength Index.

The running high jump can be predicted to a multiple correlation of .940 by combining height, the Strength Index, the Speed Factor, and dead weight.

The 16-pound shot-put can be predicted to a multiple correlation of .995 through combining the standing broad jump, the speed factor, weight, and height.

The five combinations indicated above are all major positive contributions of this study, and for the purpose of accurately predicting

the running broad jump, the 60-yard dash, the Speed or Velocity Index, the running high jump, and the 16-pound shot-put, I have computed a regression equation for each. Since I wished to predict these events in the form of T-scores, I have placed the mean at 50 and the standard deviation at 10, and the resultant equations are given below.

The running broad jump = .745 (Velocity Index of person tested) + .0404 (Strength Index in pounds) + 2 (height of person in inches) — .609 (weight in pounds) — 96.67.

The 60-yard dash = 1.007 (Velocity Index of person tested) — .453 (weight in pounds) — .54 (running broad jump in feet) + 2.063 (height in inches) — 69.14.

The Velocity Index = 1.06 (the average yards per second for 60 yards) + .119 (baseball throw for distance in feet) + .67 (4-pound shot-put in feet) — .019 (Strength Index in pounds) + 14.33.

The running high jump = 2.114 (height in inches) + .063 (Strength Index in pounds) + .358 (Velocity Index of person tested) — .788 (weight in pounds) — .92.7.

The 16-pound shot-put = 2.134 (standing broad jump in feet) + .283 (Velocity Index of person tested) + .738 (weight in pounds) — 3.791 (height in inches) + 172.87.

The above equations give the running broad jump; the 60-yard dash; the Velocity Index; the running high jump; and the 16-pound shot-put in the terms of T-scores for the sample of university men tested.

SUMMARY AND CONCLUSION

The writer has analyzed weight, Strength Index, baseball throw, the one-, four-, and sixteen-pound shot-puts, the 60-yard dash, the running high jump, the running broad jump, standing broad jump, and height—a total of eleven variables—in terms of strength, velocity, height, and weight, as possible contributing factors to the above named events, and it seems reasonable to make the following conclusions:

1. That strength as a distinct factor can be isolated and measured to a reasonable degree in performances where strength is a factor.

2. That "pure speed" as a contributing factor to the events analyzed in this problem, can be isolated and measured to a reasonable degree of accuracy by this indirect method.

3. That "dead weight" as a positive or negative factor in performances of the nature used in this problem, can be isolated and indirectly measured.

4. That height can be isolated and shown to be positive in some events and negative in others.

5. That I have set up five regression equations that will predict the running broad jump, 60-yard dash, Velocity Index, running high jump, and the 16-pound shot-put to multiple correlations that are equal to the coefficient of reliability, or practically so, in each event.

A Study of the Social Values of a Team Game and of Two Individual Sports as Judged by the Attitudes of Freshman College Women

By Helen W. Hazelton and Junerose Piper
Purdue University

THE PROBLEM

IT IS the practice at Purdue University to interview each student after her physical examination and advise her as to her fall registration on the basis of her health grade, her previous physical education experience, her interests, and her needs. The majority of the freshman women come from small high schools where the physical education program has been meager with little or no outdoor fall activity except baseball or a little soccer. With a system of free electives and no guidance, most of the students would choose tennis or swimming as their fall activity if interest alone were considered. The staff has felt that to have freshman women in a group activity such as a team game for their first term in a college community would be an aid to their social adjustment in a new and confusing environment. They have also felt that there were some social values to be obtained from a team game, perhaps more surely or more easily than from an individual sport and that if a girl had *not* had team game experience, she should be directed into a team game for her fall activity for the special values to be obtained. The present study was set up in an effort to determine whether there was any justification for these hypotheses.

PROCEDURE

A questionnaire was devised to estimate whether there were any differences in the attitudes in respect to some social traits of students taking individual sports as compared with the attitudes of those taking team game activities. The fall term activities, speedball, archery, tennis, were the ones measured.

The questionnaire was given in two successive years, 1936–37 and 1937–38, the first time in the spring, six months after the fall term (238 students, hereafter referred to as Group I); and the following year, in the fall, immediately after the fall term (303 students, hereafter referred to as Group II). The same questionnaire was given both times. The activities compared in both cases were Speedball (Group I.—91 students, Group II.—131 students); Tennis (Group I.—94 students, Group II.—104 students); and Archery (Group I.—40 students, Group II.—65 students). A sample questionnaire is attached.

The data have been treated in two ways: (1) the percentage of students was determined in each activity (speedball, tennis, archery) that recorded a certain attitude; and (2) the percentage of students in speedball, as representing the group activity, was compared for each attitude with the percentage of students responding to that attitude in (a) tennis and (b) archery, as representing individual activities.

It should be stated that all of the college classes are taught by staff members—no practice teachers, and that each staff member can be rated as a well-trained teacher in her activity.

TABLE I

WHY DID YOU TAKE THE ACTIVITY?

First row of figures is group I, tested in the spring; the second row is group II, tested at the end of the fall season.

	Percentages			Critical Ratio	
	Archery	Tennis	Speedball	Speedball-Archery	Speedball-Tennis
Because my friends	0	0	3	+2.1	+2.1
took it.	4	1	1	—1.1	..*
Because a faculty member	15	5	54	+5.1	+8.5
advised me to take it.	30	10	82	+7.5	+15.0
Because a member of my	3	1	0	—1.0	—1.0
family or an old friend	4	1	0	—1.7	—1.0
told me to.					
Because I wanted to con-	8	48	13	+1.1	—5.6
tinue an activity I liked.	7	40	5	..	—7.0
Because I wanted to learn	58	34	37	—2.2	..
a new activity.	65	52	36	—4.0	—2.5
Because it was the only	8	2	9	..	+2.0
activity offered at a	4	11	4	..	—2.1
time I could take it.					
Other reasons.	23	0	6	—2.4	+2.3
	15	13	2	—3.0	—3.1

* Note: the dots (..) signify a C.R. less than 1.

In order to determine how universal these findings might be, either in successive years or in different colleges, the critical ratio of the difference has been calculated.* When the critical ratio is 3.0 or more, the chances are 99 out of one hundred that the same difference in attitude would always be found, and is therefore a significant difference. When the critical ratio is 2.0, the chances are 97 out of 100; when the critical ratio is 1.0, the chances are 84 out of 100 that the same differences would be found.

All values have been calculated separately for the two years, because

* The formulae used in the computation were: The standard error of the difference = the square root of the standard error of the percentage of one activity squared plus the standard error of the percentage of the second activity squared.

$$\sigma \text{ diff} = \sqrt{\sigma^2_{(1)} + \sigma^2_{(2)}}$$

$$\text{The critical ratio} = \frac{\text{difference in percentage}}{\text{standard error of the difference}}$$

Since the formula for uncorrelated measures was used, the critical ratios are conservative estimates of the truth. A critical ratio of 3.0 or more is a significant difference.

it is not known in what ways the reporting of attitudes would be affected by the amount of time between the end of the sport and the recording of attitude.

TABLE II

REACTIONS OF FRESHMEN TO THE ACTIVITY THEY TOOK.
The first row of figures is Group I, tested in the spring; the second row is Group II, tested at the end of the fall season.

	(a) Percentages			(b) Critical Ratio	
	Archery	Tennis	Speedball	Speedball-Archery	Speedball-Tennis
I enjoyed the sport very much. I had fun.	85	66	72	—1.9	..*
	93	77	79	—2.9	..
I enjoyed playing with other girls.	40	47	74	+3.7	+3.9
	35	62	79	+6.3	+2.9
I enjoyed feeling that I belonged to a group.	23	17	41	+2.2	+3.7
	22	24	47	+3.8	+3.7
I enjoyed the activity because the girls in the class were good sports.	23	22	50	+3.2	+4.0
	34	34	44	+1.4	+1.5
I made new friends.	73	60	78	..	+2.8
	74	74	80	+1.0	+1.1
It taught me to be considerate of others.	28	16	40	+1.4	+3.7
	20	20	40	+2.9	+3.2
I learned more about other people.	25	18	34	+1.1	+2.5
	18	24	27	+1.3	..
I talked with girls before and after class.	48	72	73	+2.7	..
	51	79	78	+3.8	..
I liked building up more skill.	73	58	54	—2.1	..
	63	70	49	—1.9	—3.3
I liked the sport better than I thought I would.	40	12	48	..	+6.0
	37	25	64	+3.7	+6.3
I did not like the game because I had such poor skill.	0	9	6	+2.3	..
	3	5	0	—1.4	—2.3
The class was all right, but I didn't like dressing and undressing	13	27	18	+1.0	—1.6
	25	17	10	—2.5	—1.5
The sport wasn't fun because the girls in the class couldn't get together.	0	0	0	..	..
	0	0	0	..	..
It was dull, I was glad when the class hour was over.	0	4	3	+1.8	..
	0	1	1	+1.0	..
I was afraid I would get hurt.	0	1	1	+1.0	..
	0	0	2	+1.6	+1.6

* Note: the dots (..) signify a C.R. less than 1.

Table I presents the student's statement as to why she took the activity.

Table II presents: (a) the percentages of students' attitudes toward each activity and (b) the critical ratios of the differences between (1) speedball and archery and (2) speedball and tennis. In the table of critical ratios, the positive sign (+) means that the difference is in favor of speedball and the negative sign (—) means the difference is in favor of the individual sport. The dots (..) indicate that the critical ratio is less than one and consequently of no appreciable significance.

FINDINGS OF THE STUDY

Table I. Choice of Activity.—

1. With each group, the advice of the faculty was the determining factor in choosing speedball. If the student had been left to a free choice, speedball would have been chosen by a much smaller number.

2. More students took speedball because their friends took it than tennis or archery.

3. Tennis was chosen primarily because they wanted to continue an activity they liked.

4. The chief reason for choosing archery was because they wanted to learn a new activity.

5. The "other reasons" for choosing archery or tennis in preference to speedball was usually a health reason.

Table II. Reactions of Freshman Student to Activity.—

A. Selecting for the purposes of this study the items which bear directly on social development, we find:

1. Speedball ranks over both tennis and archery with a *significant difference* in: (*a*) enjoying playing with other girls, (*b*) enjoying feeling that one belongs to a group.

2. Speedball ranks over tennis with a significant difference, and over archery with an appreciable difference in learning to be considerate of other people.

3. There is an appreciable difference in favor of speedball, although not a statistically significant one, over both tennis and archery in: (*a*) enjoying the activity because the girls in the class were good sports, (*b*) making new friends, (*c*) learning more about other people.

4. More girls taking speedball talked with girls before and after class than did those taking archery. There was no difference compared with those taking tennis.

B. Items not directly bearing on social development or group relationships.

1. Girls taking tennis and archery were more aware of the feeling of improving their skill.

2. In both groups, the girls who took speedball liked speedball better than they thought they would.

3. The amount of skill a girl has tends to affect her attitude in each of the three sports. It is a factor appearing least in archery, next in speedball, and most in tennis.

4. Dressing and undressing as an unfavorable factor was mentioned in the following decreasing order of frequency: archery, tennis, speedball.

5. A slightly higher per cent said tennis class was dull than said speedball was—not a significant difference. No one said archery was dull.

6. The factor of fear of injury seems to operate more in speedball than in either tennis or archery—not a significant difference.

CONCLUSIONS

Freshman students taking speedball (a team game) as part of their physical education required program feel more strongly about certain social traits than do students taking tennis or archery (individual sports). While tennis and archery might be taught so that the social values would be more obvious, under our present methods of teaching, the group playing a team game seems to be more aware of itself as a group.

The department concludes that it is a good policy to advise newly entering freshman women to elect speedball or field hockey in their first quarter of work at the University, as an aid to their feeling a part of a big University and as an opportunity for social development.

FRESHMAN QUESTIONNAIRE

We are interested in making a survey of the opinions of the Freshman girls concerning the *fall* program of physical education. Since there are no names attached, please feel free to be frank in your statements. Think back clearly to what you took in "gym" last fall.

Age..... years..... months..... I live in: Residence Hall.....; Boarding house with about 10 girls.....; Boarding house with 1 to 5 girls.....; my home.....

I. Check the activity you took last *fall* (Sept.-Nov.).
..... 1. Tennis ..... 3. Speedball ..... 5. Other
..... 2. Archery ..... 4. Rest

II. Why did you take this activity?
..... 1. Because my friends took it.
..... 2. Because a faculty member advised me to take it.
..... 3. Because a member of my family or an old friend told me to.
..... 4. Because I wanted to continue an activity I liked.
..... 5. Because I wanted to learn a new activity.
..... 6. Because it was the only activity offered at the time I could take it.
..... 7. Other reasons.

III. Check all items which describe the reaction you had to the activity you took last *fall* (reread to find all statements that describe your own reactions).
..... 1. I enjoyed the sport very much; I had fun.
..... 2. I enjoyed playing with other girls.

..... 3. I enjoyed feeling that I belonged to a group.
..... 4. I enjoyed the activity because the girls in the class were good sports.
..... 5. I made new friends.
..... 6. It taught me to be considerate of others.
..... 7. I learned more about other people.
..... 8. I talked with girls before and after class.
..... 9. The physical activity was enjoyable.
.....10. The teacher was stimulating.
.....11. I learned a new game.
.....12. I took the activity because it was good for my health.
.....13. I liked the game itself whether I ever play it again or not.
.....14. I liked building up more skill.
.....15. I liked the sport better than I thought I would.
.....16. I would have liked the sport if we could have stayed inside on cold days.
.....17. I didn't like the sport as well as I thought I would.
.....18. I did not like the game because I had such poor skill.
.....19. I felt lonely and conspicuous.
.....20. I did not like being bumped into or getting mussed up.
.....21. The class was all right, but I didn't like dressing and undressing.
.....22. The class was never dismissed in time to take a shower and get to the next class.
.....23. The sport wasn't fun because the girls in the class couldn't get along together.
.....24. I did not get acquainted with any new people.
.....25. It was dull; I was glad when the class hour was over.
.....26. The time was wasted because I'll never use the sport again.
.....27. The teacher expected too much.
.....28. I was afraid I would get hurt.
.....29. Other reactions.

IV. How many girls in your class did you learn to know (so you could speak when you met in other places)?

..... 1 or 2 girls. ..... One-half the class.
..... About 5 girls. ..... All the class

V. What W.A.A. activities have you been out for this year?

..... Hockey ..... Archery Others:
..... Volleyball ..... Tennis
..... Basketball ..... Swimming
..... Rifle ..... Fencing None:

VI. What campus activities (other than W.A.A.) have you been out for this year?

..... Y.W.C.A. ..... Exponent ..... P.I.A.
..... W.S.G.A. ..... Music Clubs Others:
..... Union ..... Church Groups
..... Debris ..... Playshop None:

Intramural Athletics for Men in Negro Colleges

By William S. Taylor
Professor of Physical Education
Arkansas State College, Pine Bluff, Arkansas

THE widespread acceptance of the intramural program has made it one of the most important phases of the physical education program in Negro schools. From the one-room rural school through the large university, provision is being made for both individual and group participation in wholesome physical activity. Each school has its own problem, i.e., the prevailing conditions for one school's program will differ more or less from those of another; however, the marked characteristics will remain the same. Hence, intramurals through their enormous diversity and popularity are becoming one of the traditions of student life within the walls of our Negro colleges.

Purpose.—The purpose of this study is two-fold: first, to ascertain the nature of the present policies and practices used in men's intramurals in Negro colleges; second, to determine to what extent these present policies and practices as used in men's intramurals in Negro colleges compare with the generally accepted policies and practices in the intramural field for men.

Source of Data.—The source of data for this study comes from 47 accredited Negro colleges, and from the review of related literature in the field of intramural athletics.

Method Used in Securing Data.—A check list covering practically all of the generally accepted policies and practices in men's intramurals was sent to all of the accredited Negro colleges. One month later, a form letter was sent to all of the colleges that had not replied. There were 47 schools, or 60 per cent, that finally replied out of a total of 78 to which check lists were sent.

Technique Used in Compiling the Data.—The technique used in compiling the data seeks to answer the question, "What are the real facts with regard to the existing conditions?" Thus, tables were made using the percentage plan for the summary of information received.

Need for the Study.—In the new and developing field of the administration of intramurals in Negro colleges, there has been no previous study made pertaining to their policies and practices. Therefore, it should be more or less interesting from an educational viewpoint, to

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This paper is an abstract of a Master's thesis, University of Michigan.

critically examine the findings of an investigation of intramurals for men in Negro colleges. Important results have accrued from studies made in white institutions of higher learning.

ADMINISTRATIVE PROCEDURES

Intramural Departments.—In regard to the data submitted by the 47 colleges, 28, or 59 per cent, have organized intramural departments. Nineteen, or 41 per cent, do not have a distinct organization but have some form of intramural activities.

Thirty of the colleges have definite names for their intramurals. Sixteen, or 53 per cent, are called Intramural Athletics; 8, or 26 per cent, are known as I. M. Activities; 4, or 13 per cent, are called I. M. Sports; and one is known by the letters I. M., and another as Intramural Activities.

Intramural Councils.—Forty-four colleges answered the question pertaining to student intramural councils. Twenty-two, or 50 per cent, have student intramural councils. Six, or 27 per cent, state that their student intramural councils have full charge of the program. Eleven, or 42 per cent, of 26 colleges report that their student intramural councils function only in an advisory capacity. Thirty-three, or 70 per cent, of the total number of 47 colleges state that they have student managers. Twenty-three, or 69 per cent, of 33 colleges report assistant student managers. Of 40 colleges reporting, 22, or 55 per cent, have sport managers in each sport. Official representatives of all teams in competition are reported by 31, or 84 per cent, of 37 colleges answering this question.

Faculty Intramural Directors.—In regard to the number of colleges that have faculty intramural directors, 27, or 66 per cent, have faculty intramural directors out of 41 colleges reporting this item.

TABLE I

CAPACITY FOR THOSE RESPONSIBLE FOR THE INTRAMURAL ADMINISTRATION

Capacity	Faculty Members	Student Members	Per Cent
Physical education teachers	22	0	46.8
Varsity coaches	15	0	31.9
Part time teachers	1	0	2.1
Student practice teachers	0	1	2.1
Student managers	0	7	14.9
Students	0	1	2.1
Total	38	9	

The accompanying Table I shows that 38, or approximately 81 per cent, of those responsible for the administration of intramurals in 47 colleges have faculty status, and only 9, or 19 per cent, come from the student group. These percentages indicate that the organization and administration of intramurals are in the hands of trained leaders in the field of athletics. It is within reason to suggest that these trained leaders

have furnished the data for this study. Since the administration of the various intramural departments is in the hands of these men, then this study should be considered reliable until further objective evidence can be obtained.

Colleges Keeping Records.—A total number of 16 colleges, or 36 per cent, out of 44, describe the uses made of personal participation record cards of their students. An impression is afforded through an interpretation of Table II as to the various uses made of these personal participation records.

TABLE II

USES MADE OF PERSONAL PARTICIPATION RECORDS

Uses	Number of Colleges	Per Cent
To determine amount of participation	15	93.8
To publicize the college	2	12.5
To compute participant's points in an individual point system	9	56.3
To determine all-year individual championships	9	56.3
To determine permanent intramural record	10	62.5
Total number of colleges replying	16	

As indicated in Table II, there are 15, or 94 per cent, of the colleges that keep personal participation records so that the amount of participation may be determined. Only two, or 12 per cent, keep records to publicize the college. Nine, or 56 per cent, keep records so that the participant's points in an individual point system may be computed. Nine others, or 56 per cent, keep records to determine all-year individual championships. Ten, or 62 per cent, keep records to determine permanent intramural records.

Thus it can be seen that practically all of the colleges keeping records try to determine the amount of participation. It may be inferred by determining the amount of participation the intramural department is kept informed as to the general health and physical condition of the participants.

Individual and Group Awards.—Nineteen, or 46 per cent, of 41 colleges make individual awards. Twenty-four, or 54 per cent, of 44 colleges make group awards. Thirteen, or 31 per cent, of the 41 colleges make provision for awarding second place winners.

As indicated in Table III, practically all the colleges make either individual, or group awards, and some make both. Twelve, or 28 per cent, of the colleges award cups as group awards. Other group awards are: plaques, 25 per cent; numerals, 18 per cent; statuettes, 14 per cent; banquets, 11 per cent; jerseys, 4 per cent; and 4 per cent award the small, solid balls to individual members of championship teams. These balls are usually designed for the sport competed in, e.g., football, basketball, and baseball.

Of the individual awards, medals are the most popular type desig-

nated. Nine, or 21 per cent, of the colleges award the small flat medals usually worn as charms. Other individual awards are: ribbons, 11 per cent; pins, 2 per cent; certificates, 4 per cent; sweaters, 2 per cent; and monograms, 9 per cent.

Thus it can be seen that making awards is considered an important if not an expensive factor by practically all of the colleges. It may be construed that the authorities believe that awards help to enliven intramural competition, and to encourage a greater number of students to participate.

TABLE III
TYPES OF INDIVIDUAL AND GROUP AWARDS

Types	Number of Colleges	Per Cent	Types	Number of Colleges	Per Cent
Medals	9	20.9	Pins	1	2.3
Cups	12	27.9	Certificates	2	4.7
Numerals	8	18.6	Banquets	5	11.6
Plaques	11	25.6	Jerseys	2	4.7
Ribbons	5	11.6	Sweaters	1	2.3
Statuettes	6	13.9	Monograms	4	9.3
Balls	2	4.7	None	4	4.3
			Total	43	

As seen in Table III, a description of the types of group and individual awards made by forty-three colleges is presented. Practically all the colleges make individual and group awards. Cups as team trophies are the most important awards given. The most popular individual awards are medals.

CONTENT OF INTRAMURAL PROGRAM

Program of Sports.—A variety of sports offered by forty-four colleges is shown in Table IV.

TABLE IV
PROGRAM OF SPORTS

Name of Sport	Number of Colleges	Per Cent	Name of Sport	Number of Colleges	Per Cent
Archery	7	15.9	Playground Ball	37	84.1
Badminton	13	29.5	Relays	18	40.9
Baseball	36	81.8	Shuffle Board	1	2.3
Basketball	44	100.	Soccer	12	27.3
Boxing	19	43.2	Speedball	10	22.7
Cross Country	8	18.2	Swimming	6	13.6
Fencing	1	2.3	Table Tennis	23	52.3
Football	27	61.4	Tennis	32	72.7
Foul Throwing	15	34.1	Touch-Football	28	63.6
Golf	5	11.4	Track	12	27.3
Handball	13	29.5	Twenty-One	5	11.4
Hockey	1	2.3	Volleyball	37	84.1
Horseshoes	26	59.1	Wrestling	9	20.5
Indoor Track	1	2.3	Total	44	

It is apparent from Table IV that basketball is the most popular intramural game. Basketball is included in the programs of all of the 44 colleges. Playground ball and volleyball are the next most popular games among the colleges, being tied with 37 each, which is about 84 per cent of the total number of colleges included in the study. Thirty-six, or 82 per cent, of the colleges are playing America's favorite national game—baseball—which is always popular. It is significant from these data that among a few of the colleges, playground ball is gradually usurping the place of baseball in certain localities. Tennis is next in line with 32, or 72 per cent, of the colleges sponsoring this sport. Touch-football comes next with 27, or 61 per cent. The popular rural pastime—horseshoe pitching—is next with 26, or 59 per cent. Table tennis, an increasingly popular intramural sport, is played by 23, or 52 per cent of the colleges. The remaining sports that are listed in Table IV are: boxing with 19, or 43 per cent; relays with 18, or 41 per cent; foul throwing with 15, or 34 per cent; badminton and handball, each having 12, or 27 per cent; speedball with 10, or 22 per cent; wrestling with 9, or 20 per cent; cross country with 8, or 18 per cent; archery with 7, or 16 per cent; swimming with 6, or 13 per cent; golf and twenty-one with 5 each, or 11 per cent; and fencing, hockey, indoor track and shuffle board tied with 1, or 2 per cent.

These data indicate that most of the twenty-eight sports as listed in Table IV have attained success in the various intramural departments. Three interesting features indicated by Table IV shows: (1) that the intramural programs by including new types of games are attempting to keep pace with the developing and changing desires of the student groups; (2) that the intramural programs have included those group activities, which furnish vigorous athletic exercise; and (3) that the intramural programs have included activities of an individual nature, i.e., those that may help the participant to live pleasantly in adulthood and exercise enjoyably.

Units of Competition.—A total number of 44 colleges describe the types of intramural playing units and organizations in operation at their respective schools, as Table V indicates. The class unit receives the first consideration by intramural departments since 38, or 86 per cent, of the colleges use the class as a playing unit. Probably this high percentage is due to a democratic class unity and the so-called "class spirit." Independent groups come next with 17, or 39 per cent. Dormitories are listed by 13, or 29 per cent. Twelve, or 27 per cent, list fraternities. Other types of playing units that are listed in Table V are: departments, 11 per cent; literary clubs, 9 per cent; boarding clubs, 4 per cent; geographical units, 4 per cent; and one junior-senior division, 2 per cent.

These data indicate that the class, dormitory, fraternity, and independent units are used rather extensively by many of the college intramural departments. It may be argued that the class, dormitory, and

TABLE V
PLAYING UNITS AND ORGANIZATIONS

Types	Number of Colleges	Per Cent	Types	Number of Colleges	Per Cent
Classes	38	86.4	Military units	1	2.3
Dormitories	13	29.5	Boarding clubs	2	4.5
Fraternities	12	27.3	Geographical units	2	4.5
Independent groups	17	39.9	Junior-senior divisions	1	2.3
Departments	5	11.4	Total	44	
Literary clubs	4	9.1			

fraternity units are already well organized, and that loyalty, tradition, and rivalry are present to a very high degree. Particularly salient is the fact herein presented that the independent unit stands second on the list.

The class unit is looked upon as the most successful playing unit by 20, or 77 per cent, out of a total number of 26 colleges reporting this item.

Group and Individual Point Systems.—As shown in Table VI only 15, or 32 per cent, of the colleges have group and individual point systems. Point systems are used for computing individual and group awards by 14, or 93 per cent, of 15 colleges reporting this item. Thirteen, or 86 per cent, state that point systems help to motivate the programs. Nine, or 60 per cent, claim that the point systems help to make the programs attractive. Ten, or 66 per cent, report that such systems stimulate interest in several sports instead of a few. Eight, or 53 per cent, state that point systems make for keen competition.

TABLE VI
REASONS FOR HAVING POINT SYSTEMS

Reasons	Number of Colleges	Per Cent
Serves as a basis for individual and group awards	14	93.3
Helps to motivate the program	13	86.7
Helps to make program attractive	9	60.
Keeps alive the interest of various groups	10	66.7
Stimulates interest in several sports instead of a few	14	93.3
Makes for keen competition	8	53.3
Total number of colleges	15	

Programs with Unique Features.—Eleven, or 23 per cent, of the total number of 47 colleges state assuredly that they have features of their intramural programs which they consider unique. These programs are as follows:

1. An entrance fee is charged the various intramural teams and the revenue enables the winning teams to have a banquet.

2. The choice of activity is optional and the participation is almost 100 per cent.

3. We have a sports' club whose function is to discuss officiating and players' attitudes.

4. Certificates are given to winning intramural participants, and even letter men want to win them.

5. From the school's roster the students are placed on teams. The student managers try to encourage their participation.

6. More credit in points is given for losing than for defaulting a game. This places a premium on participation.

7. We sponsor coeducational tennis and dancing as intramural activities.

8. We have developed keen interest without the use of expensive awards.

9. We have placed students in full charge of planning and conducting intramural activities, and we find that the students have unusual interest as a result.

10. Professional physical education students handle the various activities, and the managers have charge of the detail work.

11. Our intramural participants show more enthusiasm than do the varsity men.

CONCLUSIONS AND RECOMMENDATIONS

Analyses have been made in the previous pages of the prevailing problems found in the general field of intramurals, and more specifically of the problem in men's intramurals in Negro colleges. Tables were arranged in order to give proportionate emphasis to those items affecting the solution of the problem. The percentage plan is used to calculate statistics.

The reader should bear in mind that this study of men's intramurals in Negro colleges is a pioneer work. It is not claimed that the interpretation of the practices and policies of intramurals as found in this study is applicable to all situations. The significance of the findings concerning majority practice, and those representing extreme divergence are probably due to the geographical locations of the various colleges.

A study by Hughes determines and evaluates standards and policies in the administration of intramural athletics for men.[1] Thirty of these standards and policies, which is about 28 per cent of the total number, were judged essential by ten specialists in the intramural field.

The standards pertaining to organization and staff in Hughes' study definitely state that the physical education department should include and control intramurals. As indicated in Table I, approximately 81 per cent of those in charge of intramurals have faculty status, and only 19 per cent come from the student group.

It has been pointed out in the study of intramural councils that 42

1 William Leonard Hughes, *The Administration of Health and Physical Education for Men in Colleges and Universities* (New York: Teachers College, Columbia University, 1938) 155–7.

per cent function in an advisory capacity, and that 27 per cent have full charge of the program. These data imply that a number of colleges approve the idea of student control. Yet it may be argued that student management is good only up to a certain point. The standard referring to this item holds that the intramural director should act as a high court of appeal on questions that the intramural councils cannot decide.

One-third of the colleges describe the uses made of personal participation record cards. It was indicated in Table II that practically all of the respondents use records in order to determine the amount of student participation.

The standards on awards definitely state that they should be symbolical of achievement rather than prizes with pecuniary value. They further state that awards should be limited as to numbers so that they will not lose their value in the estimation of the students. The fact that the most popular team award is given by almost one-third of the respondents, and that the most popular individual award is given by more than one-fifth, shows that the team trophy is looked upon with greater favor. It may be inferred from these data that the respondents look upon the team award with greater favor because teams have a certain degree of permanency and organization.

Recommendations.—The principles recommended for an ideal Negro college intramural department for men based on the findings of this study are as follows:

1. Organize all of the eligible male students into an intramural athletic association and draw up a constitution.

2. Insist that the head of the department be a trained man in the athletic field with faculty status.

3. Select a small number of sports for the program, and increase these as interest, facilities, and organization will permit.

4. Require all men participating in strenuous activities to pass a medical examination.

5. Provide a fair distribution of time, space, and equipment between varsity and intramural teams.

Review of a Decade of Research in Aquatics at Springfield College, 1929-1939

By Thomas K. Cureton, Jr., Ph.D.
Professor and Director of Graduate Studies in Health and Physical Education, Springfield College

PURPOSE

A REVIEW of the research studies which have been published in the decade 1929–1939 reflects the great importance which is being attached to aquatics as an area of program in health, physical education, and recreation. The purpose of this paper is not to summarize all of the studies in detail, but to indicate the types which have been made and to generalize briefly the outstanding *principles* which seem to be evolving from a series of studies conducted during the past decade at Springfield College, Springfield, Mass. Your attention may be directed to the bibliography of these which lists 1 doctor's thesis, 15 master's theses, 46 published articles, 9 books, 4 unpublished monographs, 1 published pamphlet, 7 charts, and 9 test sheets. This concentration upon aquatics as one area of health, physical education, and recreation work has produced some interesting results.

CLASSIFICATION OF STUDIES

For a brief summary the findings may be classified as Beginning Level Studies, Intermediate Level Studies, Advanced Level Studies, Miscellaneous Administrative Studies, Miscellaneous Program Studies, and Miscellaneous Scientific Studies.

BEGINNING LEVEL STUDIES

A number of important studies have been made relating to the teaching of beginners. An integrative report was made in 1931 of "The Psychology of Swimming Instruction."[14]* This study attempted to integrate the findings of various psychological studies by Book, Pechstein, Snoddy, Swift, Wilson, Scherer, Troland, Vogeler, Gates, Bryan and Harter, Dewey, Pintner, Kuo, Thorndike, and some others with possible implications for swimming instruction. These studies and others conducted at Springfield College on the skill elements, their relative

A paper presented before the Research Section, Recreation Division, American Association for Health, Physical Education, and Recreation, San Francisco, Calif., April, 1939; and before the Women's Section of the International Aquatic Forum, Fort Lauderdale, Fla., Dec., 1939.

* Refer to numbered Bibliography at end of article.

difficulty, rate of learning with specified methods of instruction, influence of motivational devices, and results with the Progressive Rotational Testing Method, are further elaborated in the texts *"The Teaching of Elementary Swimming and Diving"* [16] and *"How to Teach Swimming and Diving."*[23] These studies show the great importance of fear-reduction psychology and give examples of successful applications. A five-year experimental program with Springfield Public School children in the pools of the Y.M.C.A.'s, college, boys' club, and Trinity Church demonstrated the feasibility of alternating or rotating four types of emphases in the lessons, (*a*) Demonstration and Preliminary Mass Drill, (*b*) Instruction in Classified Squad Groups, (*c*) Recreational Stunts and Games Adapted to the Ability Level, and (*d*) Progressive Testing on Skill Elements for Each Individual. This work led to the reporting of *"A Course of Beginner's Swimming and Diving Instruction"* [24] which incorporated as well as possible the principles evolved from the psychological studies, including the introduction of the skill elements in an ascending order of difficulty. These studies were conceived as leading up to *"A Scientific Pedagogy of Swimming and Diving."* [19]

In the doctoral study *Standards for Testing Beginning Swimming,*[31] the tabulation of the skill elements advocated in the published literature of 21 nationally recognized authorities, 6 national organizations, and two prominent city recreational department systems shows seven convenient categories of skill elements and at least 86 different skills. A *Master List* is presented of these skills (29, pp. 163–174). This wide assortment of skills was sifted and statistically analyzed for relative validity and relative difficulty using data involving 1000 experimental pupils. For progressive testing purposes the 86 items may be reduced to as few as 21 and still permit good representation of the seven categories and high prediction of the criteria of swimming ability. The evidence is based upon about 500 bi-serial and tetrachoric correlation coefficients and a number of multiple regression solutions. An interesting comparison shows that the opinions of two groups of experienced instructors, 85 in one group and 143 in the other, agree remarkably well with the objective experimental findings. *This study represents the first intensive curriculum analysis in this area of swimming.* There is evidence to support a unified program for boys and girls alike at the junior and senior high school ages. These studies have been adopted by the *National Aquatic Committee* of the Y.M.C.A. as the basis of the new National Y.M.C.A. Aquatic Program.[30, 33] Schools, colleges, camps, and municipal pools are also taking advantage of the results and are using the new Master Charts,[34] Instructor's Work Charts,[35] and test sheets, [36] which incorporate the findings.

Two outstanding studies by Springfield College graduate students should be mentioned. Begg's master's thesis (1938) *National Survey of*

Methods of Teaching Beginners to Swim and Kuscher's *National Survey of Methods in Beginner's Campaigns* are both comprehensive surveys of experienced opinion regarding the feasibility of various methods of teaching beginning swimming, both closely allied with the previously mentioned studies of testing beginning swimming. It is clear that the results of these studies show that the sharp limitations of the "Learn in a Few Lessons Methods" are being appreciated and that there is a definite trend toward more comprehensive and satisfactory methods of instruction which bear out more fully the fundamental principles of motor learning, including (*a*) more skills, (*b*) a balance of skills according to needs, (*c*) the most valid skills, (*d*) progression according to relative difficulty, (*e*) more time to teach and more time to learn. These basic considerations are probably more important than the possible relative advantage of the "whole" over the "part" method, or other modifications, such as the "progressive-part" or "whole-part-whole" method. There is more similarity to the latter two combination methods in the Y.M.C.A. teaching materials, although the term "Combination Rotational-Testing Method" is advanced as fitting the procedure which has evolved empirically in these more recent studies.

INTERMEDIATE LEVEL STUDIES

There is evidence in Morris' *National Survey of Intermediate Instruction* to indicate the great lack of adequate intermediate instruction to follow up the beginner's work.[65] Observe a typical group in a park pool and compare the range of skills used with the recognized available skills for the intermediate level. An observation class was assigned to such a project in a public park pool in Springfield, Mass. Each observer listed in diary order fashion the skills used by one person selected at random. The average person used less than 10 per cent of the skills which may be conveniently listed for this level, which includes at least 113 skill items.

Considering the performances of the entire male student body at Springfield College over several years,[32] the range of speed performance in 100-yard crawl swimming varies from 156.5 seconds to 53.0 seconds, the mean being 95.9 seconds. In the plunge the mean distance is 32.5 feet with a range from 22 to 43 feet; in the 40-yard crawl back stroke the mean time is 39.0 seconds with a range from 63 to 21.0 seconds; in the 40-yard breast stroke the mean is 37.2 seconds with a range from 59 to 22 seconds; the average student is able to do 6 dives acceptably well with the range from 0 to 20 dives; the average time for treading water is 3′–24″ with the range from 0 to 12′–6″;* and the average student can tow a subject 60 feet in 33.3 seconds with the time ranging from 0 to 58.5 seconds. An extensive project is now under way which aims to extend these scales for more universal application including many other events.

* The maximum allowed.

The intermediate skills have been studied logically and statistically.[27, 29, 65] The skills group conveniently into *five* categories for instructional emphasis. A tabulation of the skills included in the texts of five chosen experts gives 113 items. An analytical and experimental sifting of these shows that a skeleton outline of most important skills consists of 30 most valid items, representative of the five categories, in each of three subdivisions, i.e., low, middle, and high difficulty levels. The item analysis evidence obtained by statistical methods seems clear but experienced teachers do not agree as well with each other, or with the experimental-statistical evidence as in the case of the beginning level. However, the evidence does not seem to justify different standards for boys and girls at the junior and senior high school level. Progressive tests are now available for the low, middle, and high difficulty phases of the intermediate level. The results of these studies have been adopted as the basis for the New National Y.M.C.A. Aquatic Program and are contained in a test booklet,[33] master charts,[34, 35] and test sheets,[36] available through the Association Press, New York. The results are equally applicable to the work in schools and camps.

ADVANCED LEVEL STUDIES

The Advanced Level Studies group themselves in the following categories: (1) Objective Tests of Speed Swimming Factors and Predictions of Performance, (2) Mechanics of the Strokes, Dives, and Activities, (3) Swimming Endurance Studies, (4) Lifesaving and Water Safety Studies, (5) Recreational Program Studies.

1. *Objective Tests of Performance.*—The factors governing performance in speed swimming have been fairly well ferreted out. These studies began in 1930 with Cureton's master's thesis, *Objective Tests of Swimming.*[15] The study was sponsored by Dr. J. H. McCurdy with Dr. P. V. Karpovich and Professor G. B. Affleck on the committee This study opened up a number of problems and outlined some needed techniques in tests and measurements basic to the statistical studies to follow.[95] Some of the factors governing success in competitive swimming were reported in *Spalding's Intercollegiate Swimming Guide* in 1934.[25] These findings summarized about thirty departmental project studies and the results of tests on some of the 1932 Olympic candidates and contestants, at Los Angeles.[21] Further studies at Berlin at the 1936 Olympic games have given results which indicate the great importance of organic fitness and capacity, efficient stroke mechanics and coordination, with physical size being much less important. These results would not be possible except for the basic work done on studies in related aspects of tests in anthropometry and body mechanics, organic condition, and stroke mechanics. Twenty-eight items were considered in the statistical solutions. Items which correlated zero or below .200 were dropped.

Factors Governing a Short Sprint*—In predicting 20-yard crawl time the relative value of the items are by the Beta weightings, and relative percentage contribution in proportion to the Betas squared is as follows:

	Betas	Relative Per Cent Contribution to Criterion
Coordinating ability	.595	58.6
Gliding efficiency	.298	14.7
Leg kicking efficiency	.271	12.1
Strength (by Roger's Strength Index)	.181	5.5
Arm stroke efficiency	.178	5.3
Chest girth	—.127	2.7
Breath holding on flarimeter after 2 min. exercise	.071	.8
Diastolic blood pressure (sitting)	.043	.3
		100.0

The optimum combination of the above factors produced a multiple correlation of .857 without attenuation corrections. In this work it was interesting to see that physical size and body build, vertical floating capacity, horizontal floating capacity, flexibility, and pulse rate items were practically negligible.

Factors in a 100-Yard Sprint*—In predicting 100-yard sprint time the relative value of the items are by the Beta weightings obtained from the Doolittle solutions:

	Betas	Relative Per Cent Contribution to Criterion
Arm stroke efficiency	.424	46.2
Coordination efficiency	.290	21.5
Sitting diastolic blood pressure	.215	11.8
Gliding efficiency	181	8.5
Breath holding on flarimeter after exercise	.176	7.8
Leg kicking efficiency	.106	2.9
Roger's Strength Index	—.073	1.3
		100.0

The optimum combination of the above items gives a multiple *R* of .80 without attenuation corrections. The arm stroke efficiency rises to a relative position of great importance, and the organic condition items also become more important. Strength is not so important as is its precise application in the arm-stroke for efficient propulsion. Again, the body size and build items, floating capacity, and flexibility seem relatively less important.

2. *Mechanics Studies.*—No attempt is made in this short paper to

* Extracted from an unpublished monograph, "Speed and Endurance Swimming," 1940.

summarize any of the detail findings on stroke mechanics. Sufficient to say that the studies on the crawl flutter kick,[10] the crawl arm-stroke,[11] respiration,[12] and buoyancy,[20] were unit studies, as were the important studies of Karpovich on water resistance,[51] timing within phases of the stroke,[49,50] propelling force,[56,58] work and energy quotations.[59]

Fisher,[43] using data collected over several years, including the Los Angeles and Berlin Olympic data, as well as data on Yale, Dartmouth, and Springfield varsity swimmers, calculated bi-serial correlation coefficients to show that better swimming performance is associated very strongly with flexibility of the back in extension ($r = .87$), shoulder flexibility ($r = .42$), trunk forward bending flexibility ($r = .29$), ankle flexibility ($r = .38$).

Allen,[23] made a specific study on the "Mechanics and Kinesiology of the Frog Kick."

Tests for measuring and scales for rating vertical floating capacity (buoyancy)[40] and also capacity for horizontal floating[39] were devised and the items correlate very significantly with swimming time at distances of 440 yards or above.

Lanoue [62] has completed an unusual study of the mechanics of diving in which the mechanical principles governing advanced fancy diving are derived.

Fowler [44] has contributed an excellent study on the mechanics of canoeing.

Prediction equations derived by Wilson[69,70] to predict short sprint swimming from independent tests of arms and legs alone gave multiple correlation coefficients of .883 (crawl), .785 (back crawl), and .943 (breast). These studies enabled arguments regarding the relative worth of the arm and leg phases of the stroke to be settled. Cureton continued this work to derive a *coordination scale*.[41]

3. *Endurance Studies.*—From 1928–1934 experiments were conducted on expert (varsity) swimmers and intermediate class swimmers. Cureton discovered by comparing the percentage superiority of the experts over the class swimmers that the superiority was greatest in organic condition tests, next greatest in stroke mechanics and coordination tests, and least in structural aspects of size or body build. A chart was published (23, p. 15) showing these results. It was decided to develop these studies further in cooperative research.

Larson and McCurdy [47] found that 440-yard swimming time could be predicted with an optimum multiple R of .75 from a combination of standing diastolic pressure, breath holding on the Flarimeter after two minutes exercise, pulse rate after the exercise, and the difference between lying and standing diastolic. Cureton found that adding stroke mechanics factors to the circulatory-respiratory variables raised the prediction to a multiple R of .859. Cureton developed a practical *Die-off Endurance Test* which, when combined with a one-lap speed test, enabled the prediction of 100-yard crawl time with a multiple R of .912.[26]

One experiment with a controlled diet seemed to yield evidence supporting the validity of diet as being an important factor in building the kind of endurance needed in speed swimming.[22] Karpovich demonstrated that oxygen breathing improved slightly swimming efficiency at 100 yards.[54]

Factors in the 440-Yard Swim*—In considering ten factors which contribute to efficiency in the 440-yard swim, the following six were found to be most important: mechanics of stroke, thigh flexion strength, pulse immediately after exercise, ability to glide well for distance, trunk flexibility in forward bending at the hips, and blood pressure. A multiple *R* of .858 was obtained from the following five items:

Items	Betas	Relative Per Cent Contribution
Time for 60′ sprint	.139	2.3
Thigh flexion strength	.603	44.2
Pulse immediately after breath holding following 2 minute's exercise	.568	38.9
Push and glide for distance ability	.195	4.6
Trunk forward flexibility	.281	9.6
Buoyancy (vertical floating capacity)	.049	.4
		100.0

The leg strength in the kicking movement seems very important. This is in line with a similar finding that Olympic candidates are relatively more superior over college varsity men on leg kicking velocity than on arm stroke velocity or whole stroke velocity. The pulse after exercise and breath holding probably indicates the efficiency of the blood and other organic systems to compensate for fatigue. Flexibility is next important. It is interesting to see that organic condition factors have become more important than the stroke mechanics factors which were more dominant at the shorter distances.

4. *Lifesaving and Water Safety Studies.*—Karpovich has contributed basic principles to life saving and water safety theory through his laboratory studies of drowning and resuscitation.[50, 53, 55]

Stone made a critical analysis of the lifesaving and water safety educational program in a master's thesis.[66] The content of this work, supplemented by a survey of expert opinion and by a theoretical test devised by Cureton and Silvia is now published as the basis of the New Y.M.C.A. National Lifesaving and Water Safety Program.[37]

5. *Recreational Program Studies.*—In 1929 a survey was made of 1100 camps to determine the status of the waterfront equipment and program.[7, 8] A monograph incorporating these results was written for the American Red Cross.

* Extracted from an unpublished monograph, "Speed and Endurance Swimming," 1940.

Wickens [58] applied some of the results of the beginning and intermediate studies to a typical camp program with good results.

The manual *Recreational Swimming Activities* [13] has been illustrated by Felix Pfeiffer and will be published in the next year by the Association Press. This study incorporates stunts, games, and various program activities as developed in the classes of G. B. Affleck and T. K. Cureton. L'Hommedieu [63] completed a unit of the National Y.M.C.A. Aquatic Survey on Recreational Aquatics as a master's thesis to determine the extent to which these activities were used in the Y.M.C.A.'s.

MISCELLANEOUS ADMINISTRATIONAL STUDIES

Some of the most needed studies are on the status of the personnel conducting aquatics. The educational opportunities of this work were outlined to show the need for high quality leadership.[17] A recent article published in the February and March, 1939, numbers of *Beach and Pool* entitled "Professional Versus Lay Leadership in Aquatics" describes a critical situation.[42] City departments of education are pitifully slow in placing their leadership for aquatics on a desirable plane.

Clemenger [6] made a survey of the characteristics of various paid positions in the aquatics field and found that the mean annual salaries of various aquatic positions were:

College teachers and coaches	$2995.52
American Red Cross staff	2750.00
Athletic club coaches and directors	2628.57
Special group of aquatic leaders	2518.00
High school teachers and coaches	2516.68
Parks and depts. of recreation	1996.29
Y.M.C.A. directors and instructors	1954.32

The salaries reported by 138 men ranged from $300 to $5175.

The Y.M.C.A. National Aquatic Committee has recently established standards which it will strive to uphold in all Y.M.C.A.'s.[38] A recently published bulletin, "Aquatic Leadership Training Standards," is based upon a National Survey of the need. This represents the first attempt to certify aquatic directors on a professional basis. The fact that the National Education Association, through its department of Health, Physical Education, and Recreation, has recently appointed a Committee on Professional Training and Certification of Aquatic Teachers indicates a trend toward upgrading the leadership for aquatic instruction.

The studies by Griffiths [46] on pool water and the report by Wulff and McMillan on "Principles of Construction and Maintenance of Swimming Pools" [71] contribute to the administration of the pool equipment.

Two studies aid the administration of swimming meets, one on "An Analysis of the Errors of Stop Watch Timing,[18] another on "An Electrical Diving Flashboard."[72]

MISCELLANEOUS SCIENTIFIC STUDIES

Affleck,[1] Karpovich,[57] and their students Greene[45] and Hawkins[47,48] have reported studies on the effect of cold water and swimming upon the blood, the pulse, the blood pressure, and the respiration. In Greene's energy cost experiment swimming is compared with some other activities and velocity of swimming is shown to be related to oxygen cost in terms of oxygen debt and oxygen intake by a definite law.

MISCELLANEOUS PROGRAM STUDIES

Attention should be called to the results of the National Y.M.C.A. Aquatic Survey, a total project costing approximately $12,000 and subdivided into sixteen unit research studies.[28, 30, 31] This is the most extensive survey made of aquatic teaching methods and administrative problems in the seven hundred Y.M.C.A. pools.

CONCLUSION

Among the more serious problems is that of finding ways and means of making the results of studies like these known to the great body of practical teachers and administrators. The lag between practice and the available knowledge, tools, techniques, and methods should give serious concern. There is an outstanding need for systematic professional courses in our teacher-training colleges and universities to utilize some of these results and to meet the needs of the field.

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Safety in Elementary and Junior High Schools of New York City

By Hubert E. Brown, Ph.D.
Department of Physical Education and Health
New York University

THIS study was made to determine: (1) the extent and nature of the accidents incurred by the pupils in the elementary and junior high schools of New York City, and (2) the legal responsibilities of the school board and its employees in accident cases. On the basis of the above findings, principles and procedures for safety were established that might be applied in the schools for the prevention of such accidents.

Over 700,000 children were enrolled in 400 public schools in the three boroughs of Manhattan, Bronx, and Brooklyn. The study included in this group 81 per cent of all the pupils in the grades from kindergarten to ninth, inclusive, in the city.

Of the previous studies in safety, those dealing with accidents in the secondary schools and colleges were national in scope and were limited to accidents in physical education and varsity athletics. A study of vocational school accidents was confined to a single school of this type. The National Safety Council data is secured each year from school systems in various parts of the country and presents an excellent picture of student accidents on a national basis. Of the two studies made in New York City, one dealt with street accidents in a section of Manhattan while the other was confined to one school district in the same borough. No previous study has dealt with the accident situations in a large metropolitan area such as New York City. Accidents at school, on the street, at home, and in other places were included in this thesis to secure as broad a picture as possible so that procedures could be established to meet the situation as it exists in the area.

THE PROCEDURE

An advisory committee composed of leaders in the fields of education and safety was organized when the study was first conceived. Its function was to aid in the collection of data, to discuss the materials obtained, and to suggest procedures.

A staff of workers was secured from the Works Progress Administra-

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This article is an abstract of a thesis submitted in partial fulfillment of the requirements for the Ph.D. degree, School of Education, New York University.

tion to collect the necessary data from the various sources and to assist in the compilation of the data.

The accident data came from three main sources. School accidents reports for the years 1931-2, 1932-3, and 1933-4, were obtained from the files at the office of the Board of Education. The information on street accidents for the above years was secured from reports at the Safety Bureau of the Police Department. Additional accident information was secured in an intensive survey of all pupil accidents during a two-months period in whatever areas they occurred. This was secured from pupils and teachers in the schools. Surveys were also made of conditions in and about one hundred schools that might affect the accident rate. The information on the legal responsibilities was secured from the records of cases contested in the city and throughout the state.

The accident data obtained were analyzed to ascertain where and when accidents were happening, which pupils were frequently involved, the more common types of injuries, and the severity of the injuries, and the causes of and the contributory factors in the accidents. The frequency of accident was indicated by the incidence per thousand pupils exposed, or by the percentage of accidents in various situations when incidence could not be obtained because of the nature of the data. The severity of the injuries was indicated by the average days lost per injury. The results of the school surveys were compiled in two groups. One group was composed of the data from the fifty schools with the lowest school accident rate and the other was from the fifty schools with the highest accident rate. The items showing a noticeable variation in frequency were used to indicate factors which might affect the accident rate. Principles and procedures for safety were then established which could be applied in the educational programs for safety.

FINDINGS

1. Where and When the Accidents Occurred.—Nearly half of the accidents (45.8 per cent) to the pupils occurred on the street. Accidents at school (23.5 per cent) and at home (22.9 per cent) were about equal in frequency. The remaining accidents (7.5 per cent) occurred in the other places.

The length of the absence period due to accidents ranged from no time lost to 80 days, with an average of two days lost. Over one-third of the accidents (34.7 per cent) were not serious enough to cause absence. Accidents that were severe enough to cause absence averaged three days lost. Fatalities were most frequent in street accidents, (2 per cent).

It is estimated that between nineteen and twenty thousand accidents occur to pupils in these grades during the school year, with an incidence of 27.8 per thousand. The estimated time lost from school is 38,800 days or 194 pupil-years.

Manhattan was the most hazardous borough for street accidents. The rate was approximately four times that of the Bronx and three times that of Brooklyn.

Street accidents averaged 2.2 days lost. The majority were in the roadway (58.7 per cent) with the remainder on the sidewalk (36.6 per cent) and in vehicles (4.7 per cent). Over half of the street accidents (52.1 per cent) occurred between 3 and 8 P.M., with 5 to 6 P.M. hour the most hazardous. They were most frequent during the months of June, September, May, and October.

School accidents had a severity rate of 1.1 average days lost. Seven places accounted for 84.4 per cent of the accidents at the schools: playground (21.4 per cent), classroom (18.7 per cent), stairway (17.3 per cent), gymnasium (9.6 per cent), covered play yard (7.9 per cent), doorway (5.1 per cent), laboratories and shops (4.4 per cent). The gymnasium (1.4 A.D.L.),* stairway (1.3 A.D.L.), and school grounds (1.1 A.D.L.) had the highest severity rate. The noon hour was the most hazardous with one-fifth of the school accidents. The 11 to 12 noon and 2 to 3 P.M. hours came next.

Home accidents were more serious than those at school or on the street, averaging 2.3 days lost. The stairway was most hazardous (28 per cent) with the kitchen (26.1 per cent) coming next. The rest were scattered. The bathroom (3.4 A.D.L.) and the dining room (3.0 A.D.L.) had the highest severity rates.

Accidents in other places, although few in number, were the most serious, averaging 2.5 days lost. Over 70 per cent occurred in parks and empty lots.

2. *The Pupils and Their Injuries.*—Boys were twice as susceptible to accidents as were the girls. Boys sustained injuries in the head and neck region more frequently (49.1 per cent) than girls (31 per cent) but girls were much more susceptible to lower extremity injuries (29.9 per cent) than the boys (14.3 per cent).

The face, hand, lower leg, skull, foot, and ankle were the parts of the body most frequently injured. The severity rate was highest in injuries to the shoulder girdle, ankle, and knee. Young children were more liable to head and neck injuries than the older ones.

Wounds were the most common type of injury, accounting for over half of the total (55.9 per cent). About one-fourth (24.1 per cent) were muscle injuries and the remainder consisted of bone injuries (9 per cent), ligament injuries (6.1 per cent), and internal injuries (1.3 per cent). Fractures were the most serious (8.3 A.D.L.); internal injuries to the head ranked second (5.6 A.D.L.); dislocations third (4.2 A.D.L.); sprains fourth (3.5 A.D.L.); and burns fifth (3.0 A.D.L.).

On the streets the accident rate was highest with the younger children. Two thirds of the accidents in this area were to children between five and ten years of age. At the schools the picture differs with prac-

* Average days lost.

tically half of the accidents occuring to children in the eleven to fourteen year old groups.

3. The Causes of Accidents.—The most frequent stated cause was slipping (24.4 per cent) with tripping (16.4 per cent), collision with objects (9.1 per cent), hit by objects (8.5 per cent), contacting sharp objects (7 per cent), and pushing (6.3 per cent) following in order. These six stated causes accounted for 70 per cent of all accidents. The causes with the highest severity rates were collision with vehicles (3.7 A.D.L.), hazardous play (3.1 A.D.L.), handling hot objects (3.1 A. D.L.), hit by person (3 A.D.L.), and carelessness (2.5 A.D.L.).

Some activities of the pupils were more hazardous than others. On the street 40 per cent of the accidents occurred when the children were going to or from their homes or schools with about the same amount occurring during their play. At school accidents were most frequent during recess (17.3 per cent). Organized games and relays came next (9.8 per cent) with dismissal (9 per cent), changing classes (8.7 per cent), unorganized play (5.4 per cent), and when excused from class (4.8 per cent) following in order. At home accidents were most frequent when the children were going in or out of the building.

The amount of supervision had a decided effect upon the accident situation. On the streets there was little supervision of any kind at the time of accident and the accident rate and the severity rate were both high. At home there was more supervision, the accident rate was lower but the severity rate slightly higher. At school where the supervision was greatest the accident rate and the severity rate were lowest.

4. Other Factors Related to Accidents.—Accidents were more frequent in congested areas where there was little play space available to the pupils at school and in the neighborhood. Children playing in hazardous places were more common in these areas. The vehicle count was higher; there were more traffic violations; sidewalks and roadways were narrower; and the number of pupils at dismissal time was greater.

Schools with gymnasiums and those four and five stories in height had a higher accident rate. The number of stairways and the height of the risers on the stairs was greater and more varied in these schools. Junior high schools, where more emphasis is given to gymnasium work, shop work, and domestic science, had more accidents than schools with the lower grades only.

5. The Legal Status of School Accidents.—New York State is the only jurisdiction in the United States which holds that school boards *as corporate bodies* are liable to suit. The board acts as a corporate body in the maintenance of the school plant and equipment. It acts as a governmental agency in furnishing education to the public and has been protected from responsibility for its own torts or for those of its agents in this capacity.

Under Section 12-a of the Court of Claims Act of 1929, the state

assumes liability for damages resulting from negligent acts of its officers or employees. The effect of this statute upon the liability of the board has not yet been passed upon by the courts.

School officers, agents, or teachers are personally liable for negligent acts or omissions of their part, regardless of the nature of the function they perform, either corporate or governmental.

Negligence on the part of the injured person, whether sole or contributory cause of injury, is a bar to recovery. A person who voluntarily places himself in a hazardous situation when the dangers are obvious cannot recover for injuries received.

Releases executed by parents absolving the board from liability for injuries sustained by the pupils thereafter have no legal sanction. Their only value is in their psychological effect.

No teacher or other layman incurs liability in rendering first aid. First aid, however, and the immunity which it grants, extends only to a single treatment given in an emergency situation. All subsequent treatments must be given by a physician.

6. Principles and Procedures for Safety.—The school board should provide adequate school buildings, grounds, and equipment that are free from hazards and properly maintained. It is liable for damages when hazardous conditions prevail.

Principals and teachers should be conscious of the safety needs in their areas and have knowledge of the best methods to use for efficient instruction. The present procedures are not effective enough.

Adequate first-aid materials should be provided and staff members should be qualified to render first aid when necessary.

The safety program should be adapted to local conditions and needs. Local accident reports, surveys of local hazards, the grade level, and type of pupil should be basic considerations.

The outcomes of the program should be of a practical nature. The development of desirable attitudes and habits should be emphasized. The physical education program should stress the development of skills necessary for safety. Activities emphasizing stopping, starting, and changing direction quickly should receive more attention.

The phases of the school program when accidents are prevalent should be closely supervised and these periods used to develop the necessary attitudes and habits. Routine inspection for hazards and the removal or safeguarding of those discovered are important.

The program should be flexible enough to deal with accident situations as they develop. A serious accident to a pupil, catastrophies in other places, and seasonal accidents are typical examples.

Pupils should be taught to recognize their own personal limitations. Inability to control the body properly in various situations is a common cause of injury.

Street and home accidents are the most serious and should receive the attention they need. Carelessness is a very important factor in accidents in these and other areas.

The program for safety must be presented in an interesting manner if it is to be effective in accident prevention.

The only valid criteria for the efficiency of the safety education program is a decreasing accident rate.

Publicize the safety program. Secure the cooperation of parents, police, and other agencies. Develop a feeling of responsibility for others in accident prevention. The school alone cannot control conditions.

Develop and utilize pupils in the safety program. The more active part they play the greater the values received.

Evaluate methods and materials used each year, eliminating or improving those giving poor results. The teacher should be his own severest critic.

A Study of Response Time Before and After Strenuous Exercise

By E. R. Elbel, Ph.D.
Associate Professor of Physical Education
University of Kansas

STATEMENT OF THE PROBLEM

THIS study was conducted as an attempt to determine the effects of various forms of strenuous exercise upon the response time of men. The response was measured by determining the interval elapsing between the sound of a bell and the movement of various parts of the body. The effect of strenuous exercise on response time was determined by comparing the stimulus-response interval before and after strenuous exercise.

REVIEW OF THE LITERATURE

Much material has been reported dealing with the various aspects of neuromuscular response. These studies vary from the measurement of the time involved in the completion of a simple reflex action, such as the patellar or Achilles jerk, to the more complicated acts of conscious behavior. Most of the studies of conscious behavior involve the measurement of the time elapsing between the presentation of the stimulus and the response of the individual by movement of the finger. Some of the studies involve response as measured in terms of movement of the hand, a lesser number are concerned with the movement of the entire body.

In a study involving response time before and after exercise, the consideration of fatigue must of necessity enter into the discussion. It is generally accepted that fatigue is due to metabolites resulting from activity. It is also agreed that any effective conscious response to stimuli demands efficient interrelationship between the parts of the nervous and muscular systems involved. In considering fatigue all authorities recognize the fact that, in the intact organism the sequence of fatigue falls in the order of synapse, myoneural junction and muscle, with recovery taking place in the reverse order.

On the basis of the above facts it is reasonable to assume that every neuro-muscular response is affected by fatigue. In a discussion regarding this point, Ash [1]* states that the principal of fatigue is loss of efficiency, a lessening of capacity to do work or to sustain activity together with a lowering of sensitivity so that a given stimulus calls forth a response of

This is an excerpt of a thesis submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, in the Department of Physical Education in the Graduate College of the State University of Iowa.

* Refer to numbered Bibliography at end of article.

less magnitude and intensity after exertion, than before. Franz[2] finds that fatigue is evidenced by inaccuracies in movement as well as by lengthening the time of movement. Griffith[3] showed that fatigue increases reaction time, especially all reaction times under double and multiple instruction.

THE APPARATUS

The equipment for measuring the time elapsing between the application of a stimulus and the beginning of the response, both before and after strenuous exercise consisted of (a) a stimulus unit, (b) response units, and (c) a recording device.

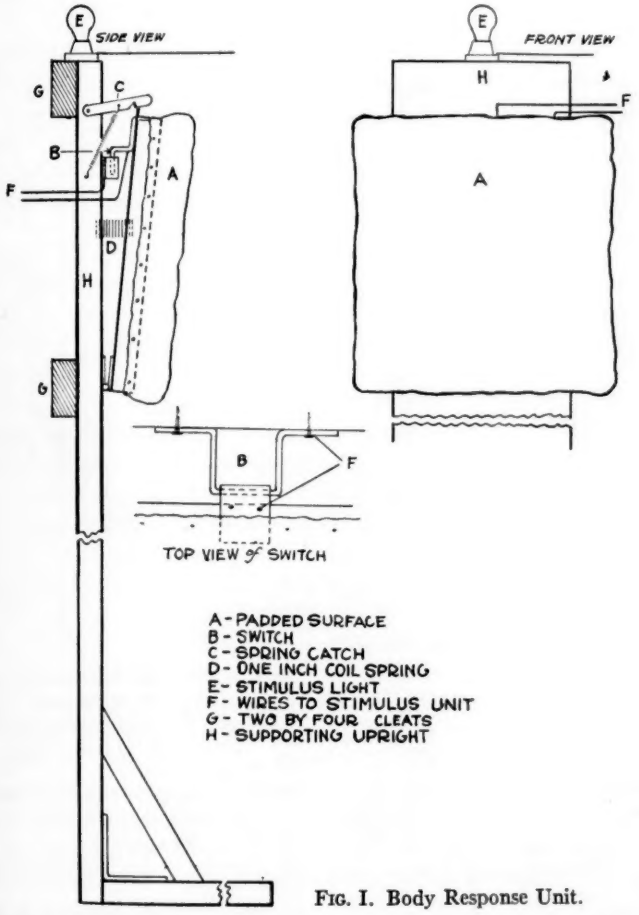

FIG. I. Body Response Unit.

Hand Response-Stimulus Unit.—The stimulus unit for all movements was constructed so that it also contains the device for the response of the finger and the hand. It has been previously described.[5]

Body Response Unit.—This device consists of a heavy board upright with a base attached at right angles forming an L. A 17-inch by 17-inch heavily padded board panel is fastened to the upright by hinges, 44 inches from the floor. Two overlapping pieces of strap iron from the contact part of the switch. These are kept in contact by the pressure of a one-inch coil spring. This piece of apparatus is placed against the wall and serves to meet the impact of the charge of the subjects (Fig. I).

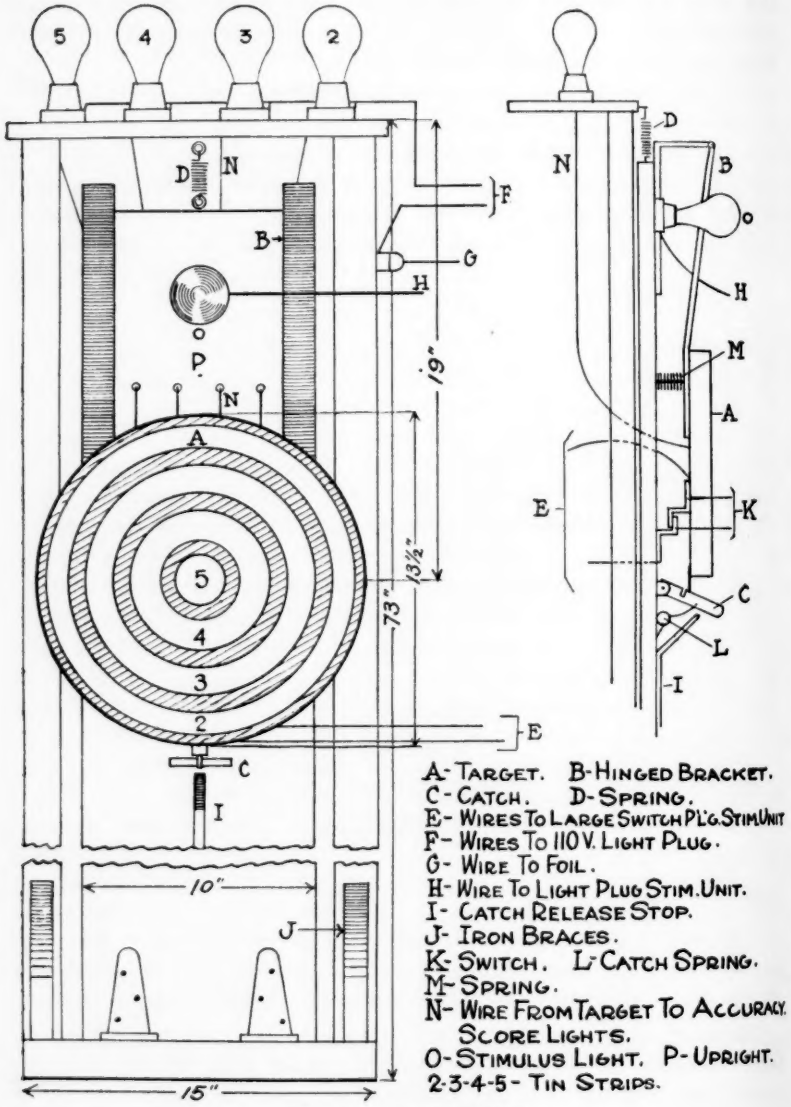

Fig. II. Fencing Target.

Fencing Target.—This apparatus was devised for use with the chronoscope in measuring the speed and accuracy of the fencing lunge. It consists of a wooden target 13½ inches in diameter, divided into four areas. Each area is covered with tin. The target is hung by metal hinged brackets on an upright, which in turn is hinged at the base allowing it to swing back with the impact of the foil. The tin areas are wired to lights which flash with the contact of the foil and serve to indicate the accuracy of the lunge. The center area scores 5 points and, proceeding outward, the others 4, 3, and 2 points respectively. This device is connected with the chronoscope. The impact of the foil breaks the contact of a strap iron switch thus stopping the falling of the chronoscope weight (Fig. II).

Stepping Stool.—One of the types of work performed by some of the subjects was stool-stepping as used in the pulse-ratio test. A stool was constructed according to the specifications and directions given by Tuttle.[4]

Recording Device.—A modified Hipp chronoscope was constructed for this study. This piece of apparatus has been described elsewhere.[5]

PROCEDURE

One hundred twenty-nine university male students ranging in age from 17-29 years were divided into nine groups in accordance with the type of exercise performed. Some of the subjects were involved in two or more groups.

Groups 1, 2, 3, and 4 consisted of twenty-five cases each. Group 1 was given three two-minute periods of stool-stepping at the rate of 30 steps per minute (same rate in all groups involving stool-stepping) followed in each period by as many push-ups as possible. One and one-half minutes rest was allowed between periods. The exercise periods for group 2 were lengthened to three periods of 4, 3, and 3 minutes respectively, followed by as many push-ups as was possible to perform in each period. The rest periods in this group were the same as in Group 1.

The exercise for groups 3 and 4 was the same as that given in group 2 but the rest periods were reduced to 35 seconds.

Group 5 was composed of 50 cases taken from members of the freshman basketball squad. The exercise was in the form of basketball fundamentals and scrimmage. Practice periods were 1½ hours in length. An accurate account was kept as to the length of each scrimmage period.

Group 6 consisted of 50 cases of intramural basketball players. The exercise was in the form of regular intramural games with 8-minute periods, allowing a 1-minute rest between quarters and a 5-minute rest between halves.

Groups 7 and 8 were composed of the same subjects. There were 20 cases in each group. The exercise for group 7 consisted of two 3-minute periods of fencing with 2 minutes of rest between periods. The exercise

for group 8 was done in two 4-minute periods with 2 minutes of rest between periods.

Group 9 was composed of 25 cases. The exercise consisted of the regular class instruction in boxing which was 30 minutes in length.

METHOD OF TESTING

For the finger, hand, and body response a preliminary study showed that 20 practice trials were sufficient to insure adequate learning. The subject was given instruction in these movements. He was then allowed two or more preliminary trials in each to become familiar with the sound of the bell. The operator then informed the subject that the stimulus would follow a warning signal in the form of a number corresponding to the trial number as spoken by the operator. After 20 practice trials in each of these movements the subject was given 7 trials before exercise and a like number after each period of work. Each trial was recorded and the average of each group of 7 trials was used as the measure of his response in that particular movement. Groups 1 and 2 were given the finger, hand and body response tests. Groups 3, 4, 5, 6, and 9 were given the tests for hand and body response. Tests were always given in the order named.

Finger Response.—For this movement the subject was instructed to place the forefinger of either hand upon a metal flange on the hand switch of the stimulus hand-response unit. The remaining three fingers were flexed loosely against the palm of the hand. The response was made by pressing the forefinger downward at the stimulus.

Hand Response.—The subject placed either hand palm down on the stimulus hand-response unit with the thumb outside a guide line 3½ ins. from the edge of the hand switch. To produce a proper response the subject was required to strike the hand-switch with the palm.

Body Response.—For this movement all subjects were required to wear rubber soled shoes to prevent slipping. Lines were painted on the floor at distances of 5 ft. 6 ins., 5 ft. 9 ins., 6 ft., and 6 ft. 3 ins. The subject was requested to stand with his knees slightly flexed, his hands resting just above his knees, and his front foot behind the line nearest in agreement with his height. Upon hearing the sound of the bell he stepped forward with the rear foot, arms extended, striking the padded panel of the large switch.

Previous to the first trial in each movement, the subject was instructed to respond as quickly as possible to the stimulus. If a subject had been used in a group previously it was not considered necessary to require him to undergo the preliminary training period. He was allowed several trials in each response before his trials were recorded. Taking the first 14 readings from the 20 practice trials and correlating the odd scores with the even it was found that the hand response gave a correlation of .9637 and the body response a correlation of .9875. These corre-

lations are sufficiently high to assure the reliability of the testing procedure.

Fencing Time-Accuracy Ratio.—This test was given the subjects in groups 7 and 8. The subject was placed in a position for the fencing lunge facing the target at a comfortable distance for the lunge which had been determined by several preliminary trials. The distance of the lunge ranged from 88 to 103 ins., depending on the subject. For the test, a chalk line was made on the floor just behind the subject's back foot. He was instructed to keep his foot in contact with this line at the start of each lunge. He was then given 10 practice trials after which 7 trials were recorded before exercise and a like number after each period. The score for each period was determined by dividing the total accuracy by the total time.

Speed-Accuracy Test.—This test was devised in an attempt to determine the speed and accuracy of the subjects by computing the total score made by punching holes into graded paper targets with a sharp stylus. The method used in the administration of this particular test has been described previously.[5]

THE DATA

The data collected from each group after exercise are presented upon the basis of exercises performed. The results were recorded in the form of mean scores resulting from 7 trials before and a like number of trials after exercise except in the case of fencing where a time-accuracy ratio was determined and in the speed-accuracy test where point accumulation is used as the index of response.

Finger Response.—Data were collected from two groups to ascertain the effect of strenuous exercise upon finger response. The same subjects make up groups 1 and 2 but group 1 did less work than group 2.

The mean scores and their standard deviations before exercise and after each period of exercise are as follows:

	Before Work	After First Period	After Second Period	After Third Period
		GROUP 1		
Means	.1614	.1604	.1533	.1580
S. D.	.0216	.0282	.0189	.0317
		GROUP 2		
Means	.1500	.1475	.1479	.1484
S. D.	.0153	.0147	.0135	.0182

Hand Response.—The hand response was measured in groups 1, 2, 3, 4, 5, 6, and 9. The amount of exercise for each group has been mentioned previously. The means and their standard deviations before and after the different periods of exercise are shown as follows:

	Before Work	After First Period	After Second Period	After Third Period
		GROUP 1		
Mean	.2822	.2862	.2825	.2805
S. D.	.0248	.0273	.0259	.0260
		GROUP 2		
Mean	.2661	.2629	.2658	.2617
S. D.	.0188	.0179	.0213	.0207
		GROUP 3		
Mean	.2726	.2771	.2763	.2702
S. D.	.0252	.0263	.0309	.0267
		GROUP 4		
Mean	.2792	.2905	.2829	.2804
S. D.	.0213	.0246	.0218	.0227
		GROUP 5		
Mean	.2606			.2473
S. D.	.0178			.0174
		GROUP 6		
Mean	.2604			.2511
S. D.	.0174			.0207
		GROUP 9		
Mean	.2633			.2475
S. D.	.0186			.0182

Body Response.—The speed of body response was measured in groups 1, 2, 3, 4, 5, 6, and 9. The amount of exercise for each group has been described. The means and their standard deviations before and after the different periods of exercise are as follows:

	Before Work	After First Period	After Second Period	After Third Period
		GROUP 1		
Mean	.9359	.9358	.9340	.9316
S. D.	.0452	.0688	.0648	.0798
		GROUP 2		
Mean	.9254	.9190	9262	.9378
S. D.	.0537	.0561	.0606	.0635
		GROUP 3		
Mean	.9288	.9233	.9310	.9300
S. D.	.0600	.0610	.0617	.0629
		GROUP 4		
Mean	.9530	.9461	.9501	.9512
S. D.	.0600	.0604	.0711	.0755
		GROUP 5		
Mean	.8792			.8658
S. D.	.0537			.0540
		GROUP 6		
Mean	.8615			.8484
S. D.	.0425			.0446
		GROUP 9		
Mean	.8773			.8381
S. D.	.0526			.0490

Fencing Time-Accuracy.—This measurement was used in groups 7 and 8. The means and their standard deviations before and after the different periods of exercise are as follows:

	Before Work	After First Period	After Second Period
		GROUP 7	
Mean	5.36	5.33	5.63
S. D.	.728	.918	.971
		GROUP 8	
Mean	5.98	6.21	6.31
S. D.	.579	.910	.979

Speed-Accuracy Test.—This test was given to the subjects in groups 7 and 8. The before and after exercise means and their standard deviations are as follows:

	Before	After
	GROUP 5	
Mean	186.	196.6
S. D.	24.30	26.93
	GROUP 6	
Mean	183.8	189.1
S. D.	23.42	21.57

SUMMARY

The following is a summary of the data collected relative to the effect of strenuous exercise on response time:

	Mean Before	Mean After	Mean Diff.	Critical Ratio	Chances in 100	
			GROUP 1			
Hand	.2822	.2805	.0017	.41	65	Faster
Body	.9359	.9316	.0043	.40	65	Faster
Finger	.1614	.1580	.0034	.57	72	Faster
			GROUP 2			
Hand	.2661	.2617	.0044	1.08	86	Faster
Body	.9254	.9377	.0123	.82	79	Slower
Finger	.1500	.1484	.0016	.50	69	Faster
			GROUP 3			
Hand	.2726	.2702	.0024	.60	73	Faster
Body	.9288	.9300	.0012	.16	56	Slower
			GROUP 4			
Hand	.2792	.2804	.0012	.04	52	Slower
Body	.9530	.9512	.0018	.23	58	Faster
			GROUP 5			
Hand	.2606	.2473	.0133	6.78	100	Faster
Body	.8792	.8658	.0134	3.35	100	Faster
Speed Acc.	186.00	196.56	10.56	3.03	100	Improved
			GROUP 6			
Hand	.2604	.2511	.0093	4.59	100	Faster
Body	.8615	.8484	.0131	2.72	99.7	Faster
Speed Acc.	183.78	189.14	5.36	1.84	96	Improved
			GROUP 7			
Time Acc.	5.355	5.633	.2780	2.03	98	Improved
			GROUP 8			
Time Acc.	5.9751	6.3070	.3315	2.37	99.2	Improved
			GROUP 9			
Hand	.2633	.2475	.0158	4.32	100	Faster
Body	.8773	.8381	.0392	7.70	100	Faster

CONCLUSIONS

The following conclusions are drawn from the data collected in this study:

1. *Finger Response.*—Using the finger as the responding member, stool-stepping and push-ups caused no significant change in response time.

2. *Hand and Body Response.*—The data relative to the effect of exercise upon hand and body response time seem to fall into two well defined divisions. In the case of stool-stepping and push-ups, there was no significant change in response time. On the other hand, response time was significantly shortened by athletic competition.

3. *Hand Speed-Accuracy.*—The data relative to the hand speed-accuracy test show that athletic competition caused a significant improvement in one group and a decided improvement in the other.

4. *Fencing Time-Accuracy.*—Definite periods of fencing caused a distinct improvement in the fencing time-accuracy ratio.

DISCUSSION

Considering the groups in the stool-stepping and push-ups as a whole, even the maximum amount of work did not appreciably influence the response time. It is of interest to note that the groups showing the most significant improvement in response time were those which had engaged in activities which were selected by the various subjects. The activities were of a competitive nature, such as basketball and boxing. There is here the possibility of the motivation of a meaningful activity being responsible for this fact.

While the groups involved in these activities showed improvement in response time, it is assumed that if the work were carried on for a sufficiently long period, the response time would gradually become slower. While most of the activities of a competitive nature were not conducted over excessively long periods, the scrimmage in freshman basketball was in some instances, carried on for longer than normal playing time. In many instances, even though the subject complained of a marked sense of fatigue, the after work response time was an improvement over the before exercise readings.

It is suggested that in the competitive exercises an emotional component arises which may be an influencing factor in the reduction of responsive time. The fact that the response times before competitive exercise are faster than those before stool-stepping and push-ups lends credence to this view.

It is suggested that individual cases that became slower after exercise were experiencing the onset of fatigue to the point where there was a lessening of ability to respond.

This study was conducted under the direction of Professor W. W. Tuttle of the Department of Physiology, University of Iowa.

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Teaching Hygiene Visually

By Fred S. Kent, M.D.
and Howard A. Prentice
University of Vermont

AN EXPERIMENT in the teaching of personal hygiene by the use of motion pictures was reported a short time ago in the Research Quarterly.[1] The experiment was carried on at the University of Vermont during the year 1938-39. In the interests of further proof it was repeated during the current year. The purpose of the experiment was to compare the results of teaching hygiene by the orthodox verbal method with those accruing by the use of motion pictures. Briefly summarized, the results of the 1938-39 experiment were as follows.

1. Teaching hygiene showed a 4 per cent improvement in grades on comparable tests when it was taught by motion pictures.

2. When motion pictures were used, there were 2.7 per cent less absences than those occurring when the orthodox lecture method was followed.

Because of insufficient evidence of one year's study, it was decided to repeat the experiment in the year 1939-40. Therefore the present freshman class of 235 men was given the course in which motion pictures were the chief teaching medium. The same method was used as was carried out in the preceeding year. That is, the course was given in eight hours, the classes meeting once a week for eight consecutive weeks. Following the series of class meetings an examination was given. Films used were both sound and silent. Films were previewed and selected by the Medical Director. The classes were arranged into eight units using the films as shown at the top of page 97.

PROCEDURE IN 1940 EXPERIMENT

The first hour was devoted to describing the nature of the course and discussing an outline of the subjects to be covered. Emphasis was placed on the concept of healthful living as the theme of the course at this meeting of the class. At this time a mimeographed outline of the seven teaching units was handed to each student. In subsequent hours the procedure was to exhibit the films following which a question and answer period was held. In the silent films by means of microphonic attachment to a loud speaker the instructor gave a running comment of the salient points to be emphasized. At the end of the course, similar

[1] F. S. Kent and H. A. Prentice, "A Comparison of Two Methods of Teaching Hygiene to College Students," Res. Quar., 10:2 (May 1939) 133-6.

Title of Unit	*Motion Pictures Used*
UNIT I—General Outline of Healthful Living (Description of Course)	None
UNIT II—Biology and Reproduction	* Heredity [4] * Reproduction in Mammals [4] Gift of Life Series No. 4 [2]
UNIT III—Body Framework	Body Framework [3] * Mechanism of Breathing [4]
UNIT IV—Foods and Digestion	* The Alimentary Track [4] * Foods and Digestion [4] * Nutrition [7]
UNIT V—Mental Health	* The Mechanism of the Nervous System [4]
UNIT VI—Circulation and Circulatory Control	The Heart and its Valves [1] * Circulatory Control [4]
UNIT VII—Use of Stimulants	* Ethyl Alcohol: Its Properties and Uses [5]
UNIT VIII—Body Defenses Against Illness	* Body Defenses against Disease [4] * Science in Modern Medicine Gonorrhea and Syphilis in the Male [2] * With these Weapons [6]

to past years, the students were given an objective type examination, requiring true-false, multiple choice, and sentence completion for answers. To substantiate the finding the test was made more difficult than either of the two preceeding years.

SUMMARY OF FINDINGS

In Table II are given the results of the examination together with results of the two preceding years. Further proof of the thesis of the experiment is clearly evident. As far as grades go, the marks are slightly

* Sound films.
[1] American Heart Association, New York, 1937.
[2] American Social Hygiene Association, New York, 1937.
[3] Eastman Classroom Films, Inc., Rochester, N.Y., 1937.
[4] Erpi Classroom Films, Inc., Long Island City, N.Y., 1938.
[5] National Y.M.C.A., New York, 1938.
[6] Willard Pictures, New York, 1939.
[7] Erpi Classroom Films, New York, 1939.

better than 1939, although probably not significantly so. Taking 1939 and 1940 together, it seems quite clear that when motion pictures are used as the teaching medium, better marks and fewer failures ensue. It can therefore be argued that for more efficient teaching of hygiene the method should consist largely of visual presentations. It seems that health awareness is more effectively presented through the eye than via the ear.

Another interesting conclusion of the 1939 study was confirmed, having to do with the number of student absences. An accurate check was kept of those who were absent from hygiene classes. Table I shows the percentage of absences occurring in the three years.

TABLE I

Class	Number	Per Cent of Absences
1938	215	5.
1939	205	2.3
1940	235	1.7

If attendance at classes can be used as a criterion of student interest, it would seem that teaching by using motion pictures is more interesting as well as more effective.

CONCLUSIONS

The results of this three-year experiment in the teaching of hygiene by motion pictures are significant. As a scientific experiment there have existed certain weaknesses of procedure. In view of this weakness the authors hesitate to claim conclusive proof. Check experiments are needed in other sections of the country until valid proof exists. The consensus of opinion of the staff at the University of Vermont is that enough reliable evidence has been accumulated to state that teaching hygiene by motion pictures is more effective than by verbal means. The judgment of the facts accumulated in the three-year study indicate the following significant conclusions.

1. The visual method shows approximately a 4 to 5 per cent improvement in grades over the orthodox verbal method.

2. When motion pictures are used fewer absences are noted. It may be concluded therefore, that keener interest in subject material of hygiene is evidenced when presented by this method.

3. The problem of teaching hygiene on an extensive scale to large classes in short periods of time is partially solved by the use of the motion picture.

The experiment has produced a definite need for more and better motion pictures in the field of health education. Good films, particularly those of the sound variety are very difficult to secure. Films in the general areas of mental health, the use of stimulants and body framework are especially needed. There exists sufficient films using the biological

approach, but very few of the type depicting functional health. The need is for films portraying every-day healthful living and its problems.

TABLE II

	Taught by Motion Pictures		Taught Verbally
	1940	1939	1938
98			
96			
94	1	2	0
92	1	0	1
90	3	5	1
88	10	1	1
86	7	5	4
84	10	11	6
82	14	16	13
80	17	13	10
78	37	18	15
76	28	24	18
74	22	27	27
72	30	15	24
70	11	20	24
68	13	15	18
66	11	12	13
64	10	8	15
62	3	4	9
60	3	3	6
58	2	1	5
56	1	1	1
54	1	6	2
52	0	0	2
	$N_{40} = 235$	$N_{39} = 205$	$N_{38} = 215$
	$M_{40} = 75.32$	$M_{39} = 74.43$	$M_{38} = 71.84$
	$\sigma_{40} = 7.14$	$\sigma_{39} = 7.84$	$\sigma_{38} = 7.2$
	One sigma $= 68.18 \rightleftarrows 82.46$	One sigma $= 66.59 \rightleftarrows 82.27$	One sigma $= 66.64 \rightleftarrows 79.04$

Achievement Examinations for Elementary and Intermediate Swimming Classes

By M. Gladys Scott, Ph.D.

State University of Iowa; Chairman, Research Committee Central Association of Physical Education for College Women*

WRITTEN examinations are being accepted more and more as a legitimate tool for the teacher of physical education. An objective examination requires more time and effort than the average teacher can give regularly in preparation for examinations. The results have varied from complete avoidance of examinations, or quickly formulated makeshift tests, to carefully constructed examinations rebuilt on the basis of earlier results and analyzed for their efficiency and with some knowledge of results to be expected.

The Research Committee of the Central Association of Physical Education for College Women undertook this project in an effort to provide college swimming instructors with a usable achievement examination and to demonstrate a procedure which might be followed in building other examinations.

PURPOSE OF THE STUDY

The purpose of this study was to set up an objective examination on swimming which would be useful in college swimming classes for the purpose of measuring level of understanding, classification on the basis of knowledge, and for grading.

PROCEDURE

A questionnaire concerning content and teaching procedure in classes, and the need for the examination, was sent to 42 colleges in the Central district. This included all except those known to be without swimming facilities. A few were returned saying they had no swimming, and 27 were returned with complete information on their swimming courses.

The individual items in the examination were based on the material commonly taught in classes as revealed by the questionnaires answered. It was decided to include only true-false and multiple choice types of questions. The experimental battery which was prepared for the elementary examination consisted of 43 multiple choice and 45 true-false

* Other members of the Committee working on this study were Ruby J. Cline, Margaret Fox, Catherine Snell, and Helen Starr.

items. The intermediate consisted of 37 multiple choice and 48 true-false items. The questions were constructed by members of the Research Committee. They were then given to four students in swimming classes, and five teachers of swimming for criticism of each item and suggested revision. Revisions were then made and these forms were sent to twelve schools who had expressed their willingness to administer the examinations. The examinations were returned from nine of the schools.

The items to be retained were selected on the basis of the index of discrimination and the difficulty rating. The index of discrimination ($M_{rights} - M_{wrongs}$)[1] is that commonly used for a heterogeneous group of subjects. The formula of Holzinger,[2] recommended for homogeneous groups, was used originally. It worked very well for the elementary examination, giving a selection very similar to that by the other method. In considering the subjects, particularly in the intermediate group, it seemed better to use the first formula. The minimum difference considered significant was arbitrarily selected at 6.5, which is the size of the probable error of the total distribution of elementary scores, and 5.5, which is a little less than the probable error of the intermediates. Two items were also included in the elementary examination with indices of 6.1 because they had a very high index by the Holzinger formula.

Choices in the multiple choice items which were never selected were eliminated. This accounts for the uneven number of choices in the questions. One item with less than three choices remaining was eliminated. Difficulty rating (percentage passing the item) was also considered in selection. The upper limit was set at 92 for the elementary because of a gap from there up to 94, 95, and 96; 95 for the intermediate because that seemed to be the easiest that was logical to use, and the series was continuous to that point.

All papers were scored again considering only the items retained by the above process. On the basis of the distribution of scores on this final battery, a plan was suggested for assigning letter grade values. (Score = number of multiple choice items correct + number of true-false correct — number of true-false items wrong.)

The reliability was computed by correlating odd numbered items against even numbered ones and correcting to the actual length by the Spearman-Brown prophecy formula.

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1. M_{rights} = mean total score of all cases answering item correctly
   M_{wrongs} = mean total score of all cases answering item incorrectly

2. $\dfrac{(R_U + W_L) - (W_U + R_L)}{\frac{N}{2}}$ where R = right, W = wrong, U = upper quartile, L = lower quartile, N = total number of cases.

ANALYSIS OF DATA

The twenty-seven questionnaires returned showed that:

a) 20 have beginning, intermediate and advanced classes; 2 have beginning and advanced classes; 5 have all levels mixed in same classes.

b) 9 give written examinations; 18 do not give written examinations.

c) 23 would use an examination if a good one were available.

The 12 schools included in the group to which the experimental batteries were sent represent different types and sizes of schools. There were 182 and 152 papers, respectively, in the elementary and intermediate examinations returned in time for the analysis of the items. An additional 16 in each group came in later and were included in the grading scheme. These represented the classes of at least 15 different teachers. This would appear to be a representative sampling of the schools in this district.

Since the purpose of an achievement examination is to place students along a relative scale with respect to information acquired, every item should contribute toward that rating. Otherwise it is merely superfluous, or it may have an inverse effect and detract from the efficiency of other items.

A large index of discrimination is possible only when all those making a high total score answer the item correctly and the low ones answer it incorrectly. Either of the methods discussed means essentially that the total score made is the criterion against which the item is checked. This seemed perfectly satisfactory since every item in the elementary examination and all but one in the intermediate one had some discriminative value.

This index is included in column 1 with the questions.

The difficulty rating is the percentage which passed the item. Ideally the items should range from about 5 to 95 per cent, and spread fairly evenly over that range. The difficulty rating is given in column 2. Both examinations are overbalanced with items in the easy end, and none are as difficult as might be desired. That does mean, however, that so far as individual classification is concerned, those below the average of the group will be placed a little more accurately than those above. That is perhaps an advantage.

After selecting on the basis of these two factors, there remained an adequate number for each examination. In the elementary form there are 30 multiple choice items and 26 true-false ones. In the intermediate there are 22 multiple choice and 36 true-false ones.

The reliability of the elementary experimental battery computed as stated above on 114 cases selected at random was .864. On the final batteries 100 cases were selected at random for each and yielded the following reliability coefficients: elementary, .888; and intermediate, .867. The examinations would appear to be entirely adequate in this respect.

Since most teachers must assign letter grades it seemed advisable to suggest a plan whereby this could be done in light of results found on this group. This follows a percentage distribution similar to that used in many situations.

Elementary			*Intermediate*		
A	46–54	(8 per cent)	A	44–51	(8 per cent)
B	37–45	(20 per cent)	B	38–43	(21 per cent)
C	26–36	(43 per cent)	C	26–37	(41 per cent)
D	15–25	(21 per cent)	D	13–25	(24 per cent)
Fd	7–14	(7 per cent)	Fd	1–12	(6 per cent)

A careful study of the difficulty rating of the safety items in the examinations, and of some of the discarded items brings up the question as to whether or not our safety instruction is adequate and on a par with that on swimming technique. Merely to cite a few examples from beginners—57 per cent know to hold on to canoe if upset, and 30 per cent would try to swim to shore, 46 per cent do not know what to do for cramps in the feet or legs, 38 per cent would try to give assistance to another swimmer if she swam into her. Among the intermediates, 27 per cent say sand pits and quarries are dangerous because there is a downward suction in them, 39 per cent would swim out to a person in trouble at first sign of distress, while only 50 per cent know it is dangerous to swim out and reach for a drowning person.

The questionnaires on course content also show that much of the safety instruction is left for advanced classes and in some cases is the only place where it is taught. This would appear illogical since many students never get to advanced classes, they frequent swimming and boating sites after their first introduction to swimming, and the advanced swimmers probably have less actual need for such information than do the less skilled swimmers.

It seems essential that whenever we teach an activity which has any element of danger, or which encourages the learner to put herself in situations where emergencies may arise, we must teach the source of such dangers and safe habits for herself and others.

The examinations appear adequate for the purpose for which they were designed. They do not cover every skill taught, they may not be complete enough for diagnostic purposes, but they will place students on the basis of relative amounts of information acquired and with the minimum of non-functioning material.

The elementary examination is probably a little better than the intermediate one, but it appears satisfactory when considering the range of experience and training represented by the intermediate group. The fact that there were lower scores made on the intermediate examination, even though it is easier, can be explained by two things. There was a larger proportion of true-false items in the intermediate examination, errors in which are penalized. There were fewer omissions in the inter-

mediate examination indicating that there was more guessing than on the elementary level and hence larger penalties accrued.

CONCLUSIONS

From the data obtained the following conclusions seem justified:

1. The skills taught at each level of swimming are very similar in most institutions.

2. The elementary and intermediate examinations presented here are each satisfactory as achievement measures.

3. There is considerable variation in the amount of water safety information taught in different institutions and the level at which it is taught.

ELEMENTARY SWIMMING EXAMINATION

Discrimination	Difficulty	Answer	
			Part I—Read each question carefully. Select the *one* item which best answers the question. Put the number of that item selected in the space in front of the question.
9.0	71	5	1. What is meant by timing in a swimming stroke? (1) The alternation of the drive with a rest or glide, (2) the relationship between the recovery and the drive, (3) rhythmic breathing, (4) coordination of the arms and legs, (5) coordination of the arms, legs, and breathing.
9.6	80	4	2. What is the proper method of breathing in swimming? (1) The method most natural to the individual, (2) varies with the stroke, (3) in through the nose and out through the mouth, (4) in through the mouth and out through the nose or mouth, or both, (5) in and out through the nose.
9.3	86	3	3. Why should a swimmer keep her eyes open? (1) To help keep her equilibrium, (2) to avoid being afraid, (3) to see where she is going, (4) to watch her own stroke.
7.8	59	3	4. In which direction is the force applied in any swimming stroke? (1) In the direction in which the swimmer is moving, (2) at right angles to the direction in which the swimmer is moving, (3) opposite to the direction in which the swimmer is moving, (4) toward the surface of the water, (5) toward the bottom of the pool.
6.6	27	3	5. What is the part of a swimming stroke called in which the arms or legs are moving into a position to apply force? (1) The start, (2) the approach, (3) the recovery, (4) the drive, (5) the purchase.
11.7	29	3	6. What is sculling? (1) A dive, (2) another name for the dog-paddle, (3) a safety device, (4) the technical name for the crawl, (5) the technical name for treading water.
12.3	77	2	7. What is the correct method of breathing while bobbing? (1) Inhale with the leg kick and exhale with the arm drive, (2) inhale each time before submerging and exhale under water, (3) inhale and exhale each time above the water surface, (4) inhale and exhale as rapidly as possible, (5) submerge and recover as many times as possible on one breath.

8.0	54	*1*	8. What should be done with the hands in elementary treading? (1) Execute slight downward pressing movements against the water, (2) held out about shoulder height in the water, (3) held above the water, (4) execute slight upward pressing movements against the water, (5) press alternately up and down against the water.
10.8	78	*3*	9. Which swimming strokes have a rest between every stroke? (1) Crawl and side stroke, (2) elementary back stroke and back crawl, (3) elementary back stroke and side stroke, (4) breast stroke and crawl, (5) elementary back stroke and crawl.
11.8	77	*5*	10. Where does the movement start from in the flutter kick? (1) The knees, (2) the ankles, (3) either the knees or the ankles, (4) either the hips or knees, (5) the hips.
15.6	74	*3*	11. In which situation is the flutter kick used? (1) Side stroke, (2) elementary back stroke, (3) crawl, (4) treading, (5) bobbing.
8.3	69	*2*	12. How high are the legs lifted in the flutter kick? (1) Legs are lifted out of the water to the knees, (2) heels only break the surface, (3) the whole foot is raised above the surface, (4) the back is arched so that the whole leg comes out of the water, (5) whole foot and leg stay several inches under water.
9.3	75	*5*	13. What is the correct position at the end of the leg movement in the side stroke? (1) With feet 24 inches apart, (2) top foot slightly back of underfoot, legs straight, (3) with knees together, slightly bent and feet spread, (4) with knees and heels together, knees slightly bent, (5) with knees and heels together, legs straight.
10.3	63	*1*	14. How do the arms move in the crawl? (1) Continuously, (2) pause at the finish of each arm drive, (3) pause before entering the water, (4) stop as the swimmer inhales, (5) work faster on the recovery than on the drive.
14.5	82	*3*	15. When is the scissors kick used? (1) In the crawl, (2) in elementary back stroke, (3) side stroke, (4) sculling, (5) breast stroke.
9.5	74	*2*	16. In what stroke is the glide an important part? (1) Crawl, (2) side stroke, (3) back crawl, (4) sculling.
10.5	59	*4*	17. In what respect are the crawl and side stroke similar? (1) In speed value, (2) in having continuous movement from one stroke to the next, (3) in movement of legs, (4) in the use of continuous breathing with every stroke.
7.8	49	*1*	18. How do the arms move in the side stroke? (1) Both arms move under the water for the recovery and drive, (2) both arms drive and recover just at the surface, (3) the under arm moves under water, but top arms recovers above the water, (4) the under arm comes out of the water at the end of the recovery, but the other arm remains under water the whole time, (5) both arms recover above the water.
10.4	23	*3*	19. What is the position of the body for entry into the water on a head first dive? (1) Entire body well arched, (2) back straight and hips partially bent, (3) back and hips straight, (4) back and hips slightly bent, (5) back arched and hips slightly bent.
7.4	31	*2*	20. In what position should the head be for take-off for standing dive? (1) Chin pulled in, head forward, (2) head easily erect looking straight ahead, (3) head slightly forward looking down to water, (4) head thrown back.

8.5	89	4	21. What should a swimmer do when frightened or fatigued? (1) Scream for help, (2) bob, (3) swim crawl stroke fast to shallow water, (4) float or scull, (5) get ahold of a swimming companion for support.
7.9	75	1	22. What rule should always be followed in going canoeing or boating? (1) Every passenger a good swimmer, (2) half the passengers good swimmers, (3) one passenger in group a good swimmer, (4) non-swimmers with a life preserver for each.
8.7	53	2	23. By what means would it be best to try to stay afloat in case of cramps in the feet or legs? (1) Flutter kick, (2) sculling, (3) crawl, (4) treading water, (5) side stroke.
11.6	88	1	24. What is bobbing? (1) Submerging and recovering to the surface of the water, (2) a movement to keep the body on the surface of the water, (3) a float, (4) a stroke.
6.6	60	2	25. If poor swimmers collide when swimming, what should they do? (1) Poorer swimmer retain her hold to the stronger, (2) swim away from each other as quickly as possible, (3) attempt to keep each other afloat, (4) be courteous and assist each other in any way needed.
6.8	55	2	26. Which of the following safety rules should be observed by swimmers of all levels of ability? (1) Never swim at night, (2) never go swimming alone, (3) never swim in unknown water, (4) never swim under water, (5) never swim in water over 25 feet deep.
10.8	70	2	27. How can one gain depth in bobbing? (1) Extend the arms sideward, (2) extend the arms overhead, (3) pull the knees up, (4) lean forward, (5) move the head backward with chin up.
6.1	56	3	28. In diving, which of the following is necessary from the safety standpoint? (1) Making entry into the water as far away from the board as possible, (2) keeping body completely extended when entering the water, (3) keeping arms extended above the head until the recovery to the surface is started, (4) keeping the legs together with knees straight and toes pointed.
8.3	65	2	29. If a poor swimmer stands up and unexpectedly finds herself in deep water, how is she most likely to be successful in taking care of herself? (1) By trying to assume a face float, (2) by trying to assume a back float, (3) by trying to start a side stroke, (4) by exhaling, (5) by keeping her arms high in the water to pull with.
10.6	61	5	30. What is the best way to keep the head above the surface of the water when in a vertical position? (1) Reach up with the arms, (2) close the eyes, hold the breath, (3) work the hands rapidly up and down in the water, (4) hold hands above the water and kick the legs, (5) move the hands back and forth with downward pressure on the water.

Part II—Read each question carefully. If statement is entirely true, encircle the *T*, if wholly or partially false, encircle the *F*.* Do not guess, but answer all for which you have a definite basis for a decision.

8.8	69	F	1. In recovering from a face float, the head should be raised first.

* In preparing examination papers, the letters *T* and *F* should precede the number of the question.

13.6	92	F	2. During a correct exhalation no bubbles will be made in the water.
6.7	80	F	3. Taking a deep breath before submerging the head decreases body buoyancy.
6.1	50	T	4. In a face push-off the shoulders should be submerged before the feet give the push.
7.3	68	F	5. Everyone can learn to float on the back with the feet near the surface.
6.5	58	T	6. When swimming on the back, a swimmer who wishes to turn to the left may do so by stroking only with the right arm and leg.
13.8	87	T	7. In order to stand up from a face float, both legs must be brought in close to the body.
9.6	88	F	8. The arm stroke in the crawl is made with the arms straight all the time.
9.0	86	F	9. Increased speed in swimming will come only by increasing rate of the stroke.
11.6	76	T	10. On the crawl the face should be kept under water all the time except when breathing in.
12.4	31	F	11. Breathing on the crawl should be done regularly on one side at the beginning of the arm drive on that side.
10.0	80	F	12. On a good side stroke, the face will be under water part of the time.
6.6	58	T	13. Pushing off from the side of pool into a back float with head pulled far back will cause the body to be submerged.
8.1	72	T	14. The maximum distance will be gained in taking off from side of pool into any float if the body is at the water's surface and in line with it.
10.0	82	T	15. The best way to assume a back float when starting in a treading position, is to drop the head back and let the feet float up.
9.4	65	T	16. When treading, the lifting effect of the legs is produced when the legs are brought together.
13.2	86	T	17. Putting too much force into the arm and leg movements in treading will cause the body to bob.
11.1	53	F	18. The arm recovery for the crawl is with the arm under water.
14.6	86	T	19. The correct floating position for the side stroke is with the body stretched out on the side and arms, head and legs in a straight line.
9.9	63	T	20. If swimmer bends forward at the hips, she can turn around while continuing to swim the side stroke.
11.4	62	F	21. On the scissors kick the legs should be spread vertically as well as forward and back.
8.1	61	F	22. It is optional with the swimmer which leg is carried forward on the scissors kick.
9.8	52	T	23. In a good standing dive the diver gets into the air and enters the water close to the end of the board.
6.6	65	T	24. A small board or piece of wood the size of the swimmer's arms, if not waterlogged, will support the swimmer.
12.0	86	F	25. There is no danger in a non-swimmer standing on the edge of a pool or dock and extending a pole to a swimmer who is in trouble.
7.8	30	F	26. A person drowns because the lungs fill with water.

INTERMEDIATE SWIMMING EXAMINATION

Part I—Read each question carefully. Select the *one* item which best answers the question. Put the number of that item selected in the space in front of the question.

9.9	28	*2*	1. When is most of the force applied in the kick in the back crawl? (1) As the legs push downward, (2) on the upward movement of the legs, (3) alternately on the upward and downward movement of the legs, (4) equally on the upward and downward movement of the legs, (5) with the feet as they reach the surface of the water.
6.4	62	*1*	2. When should swimmer inhale on breast stroke? (1) During beginning of arm drive, (2) during end of arm drive, (3) during arm recovery, (4) during glide, (5) whenever she chooses.
7.9	63	*5*	3. How should swimmer exhale on breast stroke? (1) Quickly, just before inhaling, (2) quickly during arm drive, (3) slowly during arm recovery only, (4) slowly during glide only, (5) slowly during entire stroke except when inhaling.
6.8	60	*4*	4. What is the position of the head on the side stroke? (1) Held high with chin down, (2) turned to look straight ahead where the swimmer is going, (3) turning so as to look alternately straight ahead and toward feet, (4) floating low, face up, chin in, (5) turned so as to watch hands as they meet under water.
6.7	79	*1*	5. In diving, how do the legs aid the lift from the board? (1) By flexing and then extending as the diver leaves the board, (2) by extending and then flexing as the diver gives the push, (3) by remaining relaxed at all times, (4) by remaining extended at all times, (5) by taking a deep knee bend.
6.6	71	*2*	6. Which error will cause an overthrow of the legs in diving? (1) Too high a hurdle, (2) ducking the head too fast, (3) jumping out rather than up as one leaves the board, (4) holding the head up too long.
7.9	52	*1*	7. In diving, which factor is most important in controlling the direction the body will take in the air? (1) Position of head, (2) position of feet, (3) length of hurdle, (4) timing of board, (5) downward movement of arms on the hurdle.
5.5	53	*3*	8. What should be the position of entry and direction under water on a dive? (1) Vertically downward within two feet of end of board, (2) entry close to board and almost parallel to surface of water, (3) close to board, almost vertically downward until entirely submerged, (4) close to board, almost vertically downward, with quick, short recovery.
6.9	58	*4*	9. How does a diver get maximum height on a dive? (1) Long hurdle, (2) take-off when board is lowest, (3) relaxed body, (4) take-off with legs and body straight, (5) leaning forward on take-off.
11.1	52	*3*	10. What should be the angle of entry into the water on fancy dives? (1) About 25 degrees, (2) about 45 degrees, (3) 80 to 90 degrees, (4) varies considerably with the kind of dive.
6.3	88	*2*	11. What are the requirements for one who wishes to swim long distances? (1) Be able to do strokes rapidly, (2) be able to do strokes with a minimum of effort, (3) be able to swim a wide variety of strokes.

9.5	76	*4*	12. Compare the use of the arms in a dive and a racing start or plunge. (1) Arms are not used in a dive but pull forward on start, (2) arms are not used in a dive but pull up on a start, (3) arms are pulled up on both, (4) arms are pulled up on a dive and forward on a start, (5) arms are not used in either.
10.3	58	*3*	13. In a running dive, what is the timing between arm lift and spring? (1) Arm lift just before spring, (2) arm lift just after spring, (3) both at same time, (4) arm lift after going into air in order to change direction.
6.8	34	*5*	14. Which factor will help prevent entry on running dive being too far from board? (1) Fast approach, (2) high hurdle, (3) lifting legs in air, (4) keeping body straight in the air, (5) keeping head high during hurdle and on leaving the board.
5.5	64	*4*	15. Which type of stroke is least advisable for endurance swimming? (1) Elementary back stroke, (2) side stroke, (3) breast stroke, (4) fast crawl, (5) back crawl.
11.6	85	*2*	16. Which stroke is best for short distance speed swimming? (1) Breast, (2) crawl, (3) side, (4) elementary back, (5) trudgeon.
6.0	75	*4*	17. Which safety rule should be observed by the best as well as the poorer swimmers? (1) Never swim at night, (2) never swim in unknown water, (3) never swim in rough water, (4) never go swimming alone, (5) never swim in water unless it is perfectly clear.
10.8	95	*4*	18. What is the essential safety requirement for one who wishes to swim long distances? (1) Tell the life guard she is going, (2) wear or tow a life preserver, (3) plan a system whereby she can signal to shore if she needs help, (4) get a boat and someone who can handle it efficiently to accompany her.
5.8	30	*1*	19. In case your canoe upsets what should you do? (1) turn canoe right side up and get inside if possible, or hold on to sides of canoe, (2) Leave canoe upside down and hold onto bottom of canoe, (3) hold to partner across canoe and wait for help, (4) swim to shore and leave canoe, (5) collect paddles and put in canoe, tow canoe to shore.
7.9	69	*3*	20. While swimming in deep water, you are grasped by another swimmer who is in trouble. What should you do? (1) Swim to shore with her, (2) hit swimmer on the head so she will release hold, (3) drop under water, push up on subject and back away before coming up, (4) kick subject so she will release hold, (5) call for help.
13.3	84	*2*	21. When surface diving or swimming under water where it is not very clear, what should you do? (1) Swim rapidly so as to hurry and get up again, (2) take very short strokes with hands always reaching forward, (3) take very short strokes with hands out at sides so as not to interfere with view, (4) take long sweeping strokes with hands at sides on glide, (5) shut the eyes to keep the dirt out.
6.2	50	*3*	22. Which of the following safety rules should be observed by swimmers of all levels of ability? (1) Never swim in the middle of the day when it is hot, (2) never dive out of a boat, (3) never swim while very hot, as after strenuous exercise, (4) never swim for at least three hours after a meal, (5) never swim in cold water.

Part II—Read each question carefully. If statement is entirely true, encircle the *T*, if wholly or partially false, encircle the *F*. Do not guess, but answer all for which you have a definite basis for a decision.

5.9	88	T	1. The position for the breast stroke is a face float, with the head lifted slightly
15.1	87	F	2. The head is turned to the side for inhaling in the breast stroke.
13.4	89	F	3. There is no rest period in the breast stroke.
13.1	64	F	4. In the breast stroke the power from the arms comes simultaneously with that from the kick.
14.6	53	T	5. Turning the toes out in the breast stroke kick helps keep the legs in the plane with the body.
5.9	60	F	6. The power for the breast stroke kick comes while the legs are being extended.
11.5	64	F	7. In the breast stroke, the swimmer inhales as the arms recover.
6.0	58	F	8. A half sitting position is best for the back crawl.
9.8	78	F	9. The wider the kick, the greater the power in the back crawl.
13.3	93	F	10. It is not necessary to lift the legs on a surface dive.
14.3	91	F	11. The position of the head is not important in a surface dive.
12.2	79	F	12. The legs will be of greatest assistance in a surface dive if used in a flutter kick on the surface.
6.0	83	F	13. It is easier to do a surface dive starting from a treading position than from a face float.
12.8	82	F	14. The approach for a running dive should be the length of the diving board.
12.7	90	T	15. Timing, height on the hurdle, and position of the body on leaving the board all affect the amount of lift from the diving board.
11.4	88	T	16. The length of the steps for a running dive will vary for different divers.
6.1	49	F	17. The steps for a running dive should be taken as a slow run with a long stride.
6.0	68	T	18. Diver should leave almost as much space for the hurdle as she uses on each step in her approach.
5.5	48	T	19. Diver should start from the same point on the diving board for approach for every dive.
17.3	90	T	20. In diving, the arm swing may be used to lift the body, turn the body, or carry it out in a racing dive.
16.5	88	T	21. Other things being equal, the more height and closer to the board on the entry, the better is a spring board dive.
15.2	95	T	22. The position of head is often the controlling factor between a good and poor entry on a dive.
8.8	48	F	23. Because the board works up and down, the spring from the board always carries the body upward on a dive.
10.2	75	F	24. In a swan dive, it is not necessary to lift the legs to get the body arch.
6.4	36	F	25. In a back dive, the back should be arched immediately on leaving the board.
10.7	82	T	26. Failure to arch the back on a back dive may result in a flat dive.
14.3	90	F	27. The arm swing is of no importance in a plunge or racing start.

10.8	76	F	28. The toes need not grip the edge in the start of a plunge or racing start.
8.2	68	T	29. A free style turn should be taken under water.
13.8	80	F	30. A turn should be made keeping the body as far from the edge as possible so as to have a head start on the next lap.
15.7	86	T	31. In making a racing turn, the knees should be bent so that they almost touch the chest.
9.4	83	T	32. Treading water may be done efficiently with the legs only.
15.2	90	T	33. The standing dive should be approximately vertical, and the plunge or racing start should be approximately horizontal.
6.1	46	F	34. The toes and heels should both touch as the feet come together in the breast stroke.
8.1	83	T	35. The length of time which should elapse after eating before going in the water depends largely upon the type of meal eaten and the reaction of the individual to it.
9.3	74	T	36. For toe cramp rub hard on inside edge of arch of foot about a third of the way from heel to toe.

New Studies in the Sargent Jump

By Deobold Van Dalen
John D. Pierce School
Grosse Pointe, Michigan

In A perusal of the literature of the Sargent Jump, the studies of D. A. Sargent,[1]* L. W. Sargent,[2] and Bovard and Cozens[3] were epitomized by McCloy in 1932 in the development of his problem when he published a group of statistical studies and experiments on the Sargent Jump.[4] McCloy in this statistical study obtained a wide range of correlations between the Sargent Jump and a battery of track and field events equally weighted.

When reading the studies cited above, the writer was impressed with the fact that in all of them there were certain vital omissions. In only one case of the above cited experiments was adequate practice given in either of the events and the results are strikingly amazing. The purpose of this study, then, is to clarify and validate the various types of jumps in general usage today under optimum conditions and statistically point out their deficiencies.

The Sargent jump, as described by McCloy, is primarily a test of the ability of the body to develop power relative to the weight and size of the individual. Power is the time rate of doing work over a given period of time. Power is force times velocity. Hence, the jump is a measure of the way in which force can combine with the highest possible contraction velocity of the muscle so as to project the body upward to a maximum height.

Track and field performances are known power events. These athletic performances such as the jumps, sprints, and the throws are events which demonstrate maximum muscle contraction over a minimum of time. It would seem logical that the Sargent Jump should be an excellent item to be included in a battery of tests designed to test this item of muscular contraction. Therefore, one would expect a relatively high relationship between these jumps and such events as track and field athletics, providing that the athletic events and the jumps are practiced until the skills are a constant.

THE DATA

The data from which this study has been made are the results of 106 senior high school boys ranging between the ages of 15 and 17 years with the greater majority ranging between 16 and 17 years.

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* References are to numbered Bibliography at end of article.

TEST PROCEDURE

We know that physical abilities vary from day to day. This varying ability of an individual's athletic performance is due to a number of physiological influences which need not be discussed at this time. Hence, the record of any individual for the Sargent Jump may be affected by one or both of two factors. The first is the skill and coordination to execute the jump correctly. The second is the ability to do one's best at any given time. Similarly, if the Sargent Jump is to be correlated against athletic events, these athletic events should be practiced until the skills are constant: and the highest correlations will be obtained when these events are practiced frequently enough that one's best possible performance is produced.

In every case the jump outlined below was taught to the class group until the form was learned and the performance of the jump was mechanically satisfactory. In view of the fact that physiological factors do determine the performance ability of the individual, various precautions in administration of the events and the jumps were taken to mitigate these possibilities.

The form of the seven jumps taught was as follows:

1. *The Sargent Jump.*—The individual was instructed to swing his arms downward and backward, inclining the body slightly forward and bending the knees to about ninety degrees and raising the heels. He was instructed to pause for a moment in this position before jumping. He was told to jump vertically upward as high as possible, swinging his arms vigorously forward and upward to a vertical position. Just before the highest point of the jump was reached he was told to swing his arms forward and downward to his side, and the end of the downward movement should be timed so that the end of downward swing coincides with the reaching of the highest point of the jump. The legs should be stretched downward, and the head should be stretched upward as far as possible but without tilting the chin. The jump was scored in cm. by how high he jumps minus his original standing height.

2. *The Sargent Weight Jump.*—The individual was instructed to follow the same directions as in the Sargent Jump with the exception that he carried one-half pound dumb-bells and a pound and a half dumb-bells in their respective jumps.

3. *The Jump and Reach.*—The form demands that the jump be similar to that described for the Sargent jump, but the individual was instructed that only the free arm be swung downward to the side as the top of the jump is approached.

In the administration of the jump, the instructor asked the pupil to stand with his face to the wall and fingers extended upward so that the individual was stretched to his fullest height. The height of the jump was taken from the level of the mark made at his finger tips when standing against the wall to the highest of the marks made when he

jumped. This same method of administration was also followed in determining the chalk and wall jumps.

4. The Chalk Jump.—The chalk jump is similar to the jump and reach except the free arm is kept down at the side of the jumper when the jump is executed.

5. The Wall Jump.—The instructor asked the pupil to face the wall and thrust his body as vertically high as possible in the air. The individual was instructed to keep the free arm at his side while executing the jump.

6. The Belt Jump.—The belt jump is similar to the Sargent jump except the hands are placed on the hips during the jump instead of a vigorous upward and downward arm swing as in the Sargent jump. The belt jump is measured by how high he jumps minus his standing height.

Thorough practice in the four track and field events (six-second run, running high jump, standing broad jump, and the shot-put equally weighted), was likewise given until the individual could perform the activity with good form. The track and field trials were held twice on different days with never more than two events recorded in any one day and with the best score in each event used for this study.

In the discussion of the results below, we shall make use of the term "Classification Index."[5] This term is used to denote an index of size and maturity obtained by the following formula: 20 (age in years) plus (height in inches) plus (weight in pounds). Age is not added beyond seventeen.

RESULTS

The results obtained in this study of physically non-defective senior high school boys in the various jumps are as follows: In the multiple correlation table *O* equals the criterion; *one* equals jump; *two* equals the classification index.

Jump	Total Points	Classification Index	Multiple Correlation	
Sargent ½ pound weight jump	.824	.513	Ro.12	.839
Sargent jump	.810	.451	Ro.12	.812
Sargent 1½ pound weight jump	.800	.495	Ro.12	.814
Jump and reach	.776	.428	Ro.12	.781
Chalk jump	.585	.395	Ro.12	.603
Belt jump	.516	.415	Ro.12	.571
Wall jump	.426	.447	Ro.12	.513
Classification index	.450			

CONCLUSIONS

From the results presented above it would seem to indicate that the Sargent Jump when standardized, practiced, and correctly administered is undoubtedly a valuable test for predicting the ability to develop power.

The arm swing of the Sargent Jump is exceedingly important to the

successful execution of the jump as indicated in the above results of the Sargent and the contracting belt jumps. The belt jumps are identical to the Sargent jumps with the exception that the vigorous arm action is prohibited.

The difference between the best two jumps is so slight that it would probably not be worth while using the weights. This does, however, give considerable evidence as to the importance of the use of the arms.

Several deficiencies exist in the chalk and wall jumps as to their administration and execution that may prohibit an accurate measurement of this jump and a warning is issued against their use.

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The Construction of a Multiple Obstacle Run for Classifying Junior High School Boys into Homogeneous Groups for Physical Education Activities

By Carlos L. Wear

Director of Physical Education for Boys
Ponca City Junior High School, Ponca City, Oklahoma

INTRODUCTION

MOST educators now realize the importance of placing students in homogeneous groups for physical education activities. This will make the learning situation more favorable to the student not only in the acquisition of skills but also in a more important direction, that of formation of wholesome attitudes. Much work has been done during the last several years along the line of working out tests of various kinds which can be used for classification purposes. However, most of these tests which adequately measure the physical status of a student require special apparatus which most schools do not possess or the tests are not easily and quickly administered.

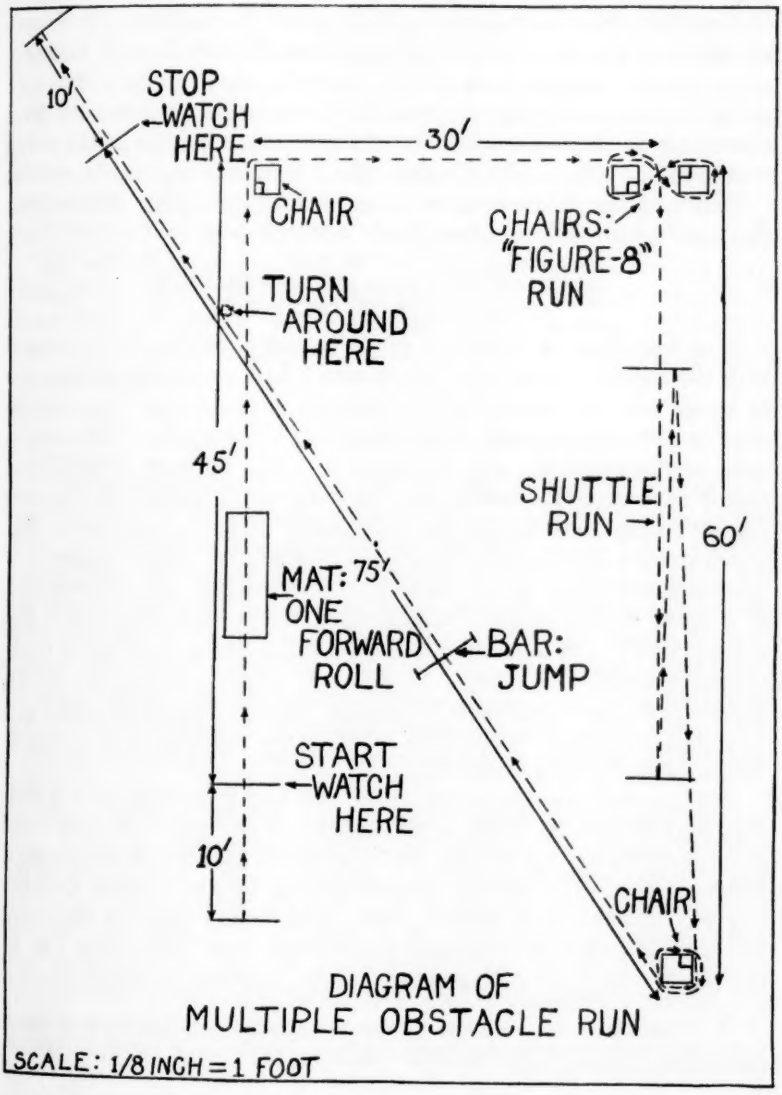
The purpose of this study was to devise a practical and an easily administered test for quickly and adequately classifying junior high school boys into homogeneous groups for physical education activities. This test was to be one which would require only equipment which all schools possess or could easily construct. In constructing this test an attempt was made to utilize the fundamental movements of running, jumping, dodging, tumbling, sudden starting and stopping, and sudden changing of direction in a series of obstacle events or stunts as a means of testing the muscular control and coordination of boys.

SELECTION AND ADMINISTRATION OF STUNTS

Preliminary to the construction of this multiple obstacle run, a list of obstacle race elements or stunts was compiled. This list was reduced to a total of twenty-three stunts which were chosen from the standpoint of economy in time and equipment, of simplicity of execution, and of making a definite test of the student's muscular coordination. The first stunt, a ten-yard dash, started from a supine position. All other stunts had a running start of ten feet in order to eliminate the influence of the start on each stunt. Each boy was required to run to a line ten feet beyond the actual finish line to eliminate the effect of a possible anticipation of stopping. Each stunt had to be performed at

the mid-point of a 30-foot course. In some of the stunts the boy returned to the starting line for the finish. Failure on any one of certain requirements disqualified a boy. In such a case the performance had to be repeated.

One hundred and two 8th and 9th grade boys were run through these twenty-three stunts. They were tested in groups of twelve with three officials: a starter, a timer, and a recorder. Each group was run through each stunt three times. In correlating the times of the trials



with the criterion only the best time of each boy on each stunt was used. The average time for each group of twelve boys to do one stunt three times was about five minutes.

CRITERION

After observing the boys take part in physical education activities for at least one semester the instructor divided them into five groups on the basis of his judgment of their athletic ability. This was used as a criterion with which to compare the times of the boys on the various stunts. Each boy's name was written on a card and the cards were divided into the five groups. No group was limited in size. Group 5 contained the boys judged superior; group 4, good; group 3, average; group 2, poor; and group 1, poorest. The instructor grouped the boys three times at two-week intervals and recorded the number of the group on the back of the card each time. Each grouping was made without reference to the numbers given at a previous grouping. From these three ratings a final rating was made for each boy.

CONSTRUCTION AND ADMINISTRATION OF MULTIPLE OBSTACLE RUN

The best time of each boy in the separate stunts was correlated with the criterion. The seven stunts which had a correlation of —.500 or better were selected to form a multiple obstacle run. The correlations of these seven stunts ranged from —.508 to —.551. The correlations of the remaining sixteen stunts with the criterion ranged from —.205 to —.493. Beginning with the stunt which had the highest correlation with the criterion and continuing in order, the seven best stunts were: a shuttle run, crossing the course three times; a jump over a bar eighteen inches above the floor; a pirouette, or one complete turn at a spot; a right-angle turn around a chair—the chairs used had writing arms*; one forward roll on a mat; running a complete circle around a chair; and running a "figure-8" course around two chairs. These stunts were combined to form a battery that would occupy a minimum amount of space. No other factor influenced the order in which the stunts were combined.

Since a start was not a part of the run each boy began with a running start in order to eliminate the influence of the start. The first stunt to be performed in the run was the forward roll on a mat (see diagram). For this stunt there was no requirement as to form except that the boy was required to go straight over. The second stunt in the series was the right-angle turn around a classroom chair. Touching any of the chairs with a hand disqualified a boy. Any act of disqualification

* On the diagram the position of the arm of the chair is noted by the small square in the corner of the large square denoting the chair. The arm is, of course, in the front, right-hand corner of the chair.

on any of the stunts meant that the boy had to start again at the beginning of the run. In such a case he lined up with the group and waited until the others had gone through the run before he tried it again. The third stunt was the "figure-8" run around two chairs placed as shown in the diagram. These chairs were three feet apart.

The shuttle run crossing the thirty-foot course three times was the fourth stunt. The fifth stunt was the complete circling of a chair. The sixth stunt was to jump over the bar placed at a height of eighteen inches from the floor and at a right angle to the course. This car was fastened to a support at each end. Each support was fastened to a base one inch by six inches Each base was placed in the center of a rectangle five inches by ten inches drawn on the floor with chalk. Causing either base to move out of the enclosing rectangle disqualified a boy. In the seventh and final stunt the boy ran to a spot on the floor turned completely around, and then continued to the finish line. As in the separate stunts, each boy was required to run to a line ten feet beyond the actual finish line to eliminate the effect of a possible anticipation of stopping.

In administering the battery the instructor had the boys walk through the course before the trials were started. Each boy was timed twice, once on each of two consecutive days. The times for the first trial were then correlated with the times for the second trial to check the reliability.

SUMMARY AND CONCLUSION

The lowest correlation with the criterion of any individual stunt used to make up the multiple obstacle run was —.508. This shows that there is a marked relationship between the times of the boys and their rating based on the instructor's judgment of their athletic ability. The correlation between the first trial on the multiple obstacle run and the criterion was $-.777 \pm .27$. It is usually understood that a correlation of plus or minus .700 or better denotes a reasonably high degree of relationship. The reliability coefficient of the battery as determined by correlating the first trial with the second was $9.49 \pm .007$. A reliability coefficient of .900 or better indicates a highly satisfactory reliability.

A statistical study was made involving the seven stunts of the battery and the criterion to determine whether a smaller number of stunts could be used to form a battery. The best multiple correlation that could be obtained with four of these stunts was —.723. In this work no one stunt seemed to be much more important than another. Since the original battery of seven stunts has a correlation of —.777 with the criterion we see that it is better than any combination involving only part of the battery

The correlation of the multiple obstacle run with the criterion is

above the accepted minimum for denoting a high degree of relationship. The run is easily and quickly administered It requires very little equipment. The chairs are available in practically every school. If there is no mat, one can easily be constructed for the purpose. The bar is easily constructed. The successive stunts are simple of execution. The floor space required is small enough to make the lay-out fit nearly any gymnasium. The reliability of the run is above the usually accepted standard. For these reasons it is believed that this multiple obstacle run should be a very useful device for rapidly classifying large classes of junior high school boys into homogeneous groups for physical education activities.

The Determination of a Reading Vocabulary in Junior High School Hygiene

By Arnold Christensen
Roosevelt Junior High School
Beloit, Wisconsin

WORDS are thought of largely as the tools of learning. Dewey has stated, "Our power to think effectively depends upon the possession of a capital fund of meanings which may be applied when desired." [1] Binet discovered long ago that mastery of general vocabulary is the best single measure of intelligence.

Charles Francis Schuller, in his master's thesis, states that there is ample evidence of a profound relationship existing between vocabulary and achievement.[2]

On the basis of these statements it would seem that a student should master a minimum essential vocabulary in any subject in order that he may understand that subject and speak and write more intelligently on it.

Working from this assumption, the writer determined a basic vocabulary in junior high school hygiene. This investigation, utilized for his master's thesis, was the result of painstaking effort under the careful guidance of Dr. C. E. Ragsdale of the University of Wisconsin.

Various vocabulary studies were reviewed with a view toward finding out what has been done, how best to avoid errors in such an undertaking, and how to make this investigation a worth-while contribution to research.

The investigation covers a total of 110,774 running words, tabulated from the first eight lines of each page from seven widely-used junior high school hygiene text books. It was found that of this total of 110,774 running words there were 7,761 different words. No word was used unless it occurred at least five times and in at least three of the texts investigated.

Applying the rule relative to frequency and range, 2,639 different words were listed. They were then checked against the Ayres [3] and the

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1 F. G. Bonser, L. H. Burch, and M. R. Turner, "Vocabulary Tests as Measures of School Efficiency," *School and Society* 2 (November 13, 1915) 713–18.

2 C. F. Schuller, "A Study of the Relationship between Vocabulary and Achievement in the Junior High School Social Subjects," master's thesis, University of Wisconsin, 1934.

3 L. P. Ayres, A Measuring Scale for Ability in Spelling, Russell Sage Foundation, Division of Education, E. 126 Street, New York, N. Y., 1913.

Thorndike [4] lists of 1000 most commonly used words and the results tabulated.

It was found that of the 2,639 words 36.4 per cent of the 1,001 words with the highest frequency and 78.5 per cent with the lowest frequency did not appear in either the Ayres or the Thorndike lists of 1000 most commonly used words.

The Ayres and the Thorndike lists of 1000 most commonly used words were employed as a check list because they are generally accepted as two of the most extensive studies yet made to determine the most commonly used words.

It is the writer's opinion that the words which did not appear in the Ayres and the Thorndike lists of 1000 most commonly used words are peculiar to junior high school hygiene and should be of value to pupils, teachers, writers, and other interested persons: to pupils as a minimum spelling list, and general classroom vocabulary; to teachers as an aid in the preparation of written material, tests, and instruction sheets; to writers as a guide to the relative imporance or unimportance of questionable words used in writing a text; and to other interested persons as another step in research toward meeting the complex classroom problems.

The investigation contains many tables of data, reviews of investigations, a complete statement of the method of procedure followed in such an investigation, and other valuable supplementary data contained in the appendix.

The following table contains a list of 365 words arranged in a descending frequency order which occur in neither the Ayres nor the Thorndike lists of 1000 most commonly used words. This table was compiled from the 1,001 words with the highest frequency of the 2,639 words mentioned above. The 1,001 words were used because the Ayres and the Thorndike lists contain 1000 words. 1,001 words had to be used because the first word beyond 1000 had the same frequency as the final word in the list of 1000.

disease	414	oxygen	136	carbon	89
muscle	400	vitamin	132	protein	89
germ	294	lung	128	surface	87
cell	244	usually	121	breathing	85
nerve	230	prevent	118	movement	83
called	209	tube	117	control	82
habit	202	gland	111	danger	82
teeth	189	energy	110	stomach	81
organ	183	substance	109	vegetable	79
alcohol	178	temperature	108	living	78
brain	167	remove	101	nervous	78
exercise	166	diet	97	likely	77
tissue	164	intestine	92	patient	77
produce	153	growth	90	mineral	75

[4] E. L. Thorndike, The Teacher's Work Book, Teachers College, Columbia University, New York, N. Y. Second Edition, 1927.

protect	74	plenty	48	desirable	37
joint	73	science	48	expose	37
poison	72	treatment	48	iodine	37
pupil	70	working	48	ourselves	37
easily	69	yourself	48	strain	37
fever	68	experiment	47	feeling	36
drug	67	explain	47	interesting	36
example	67	microbe	47	juice	36
fatigue	67	sufficient	47	liquid	36
needed	66	cord	46	properly	36
fiber	65	function	46	retina	36
medicine	65	membrane	46	upper	36
safety	65	acid	45	antitoxin	35
tobacco	65	liver	45	diagram	35
community	64	using	45	doing	35
sense	64	vein	45	essential	35
type	64	affect	44	examine	35
bacteria	63	carefully	44	frequently	35
fuel	63	cleanliness	44	having	35
physical	63	kidney	44	muscular	35
record	63	layer	44	reading	35
avoid	62	lumph	44	paste	35
dioxide	62	protection	44	below	34
digestion	61	wound	44	capillaries	34
cure	60	breath	43	dentist	34
posture	60	current	43	development	34
throat	60	keeping	43	fluid	34
tiny	60	nail	43	healthful	34
tooth	60	skill	43	hospital	34
infection	59	team	43	opening	34
making	58	digestive	42	average	33
aid	57	gas	42	cooking	33
injury	57	individual	42	harmful	33
meal	57	interfere	42	recognize	33
method	57	particle	42	spinal	33
circulation	56	problem	42	sunlight	33
ray	56	taking	42	compare	32
structure	56	trained	42	eating	32
tuberculosis	56	ability	41	idea	32
arteries	55	daily	41	lens	32
normal	55	growing	41	million	32
active	54	lack	41	player	32
corpuscle	54	occur	41	regular	32
illness	54	quantity	41	solution	32
oil	54	somewhat	41	typhoid	32
process	54	chemical	40	activities	31
training	54	glasses	40	allowed	31
depend	53	rat	40	bandage	31
describe	53	secretion	40	burning	31
learned	53	stimulate	40	camera	31
per	53	useful	40	comfortable	31
physician	53	correct	39	consist	31
chapter	52	diphtheria	39	factories	31
chest	52	giving	39	gum	31
test	52	alcoholic	38	inner	31
activity	51	carbohydrate	38	mosquito	31
pressure	51	nurse	38	parent	31
bodies	49	smallpox	38	quickly	31
dangerous	49	source	38	reduce	31
formed	49	bath	37	scout	31
mental	49	coffee	37	breathe	30
hearing	48	defect	37	calorie	30

canal	30	recreation	26	chiefly	22
compose	30	tonsil	26	content	22
flies	30	valuable	26	cotton	22
influence	30	eaten	25	decay	22
liquor	30	generally	25	greatest	22
microscope	30	healthy	25	heating	22
observe	30	hundred	25	looking	22
product	30	lime	25	particularly	22
scientist	30	longer	25	partly	22
thoroughly	30	permanent	25	perform	22
false	29	permit	25	portion	22
focus	29	sickness	25	preparation	22
image	29	swimming	25	quantities	22
ordinary	29	cavity	24	respiration	22
root	29	commonly	24	saliva	22
sensation	29	compound	24	smaller	22
smell	29	constant	24	successful	22
solid	29	cooked	24	throughout	22
chamber	28	covered	24	tight	22
internal	28	difficult	24	toxin	22
adult	27	discuss	24	ventilation	22
attack	27	efficiency	24	whenever	22
balance	27	element	24	appetite	21
bleeding	27	freely	24	burned	21
bottle	27	mass	24	changing	21
carries	27	rapidly	24	communicable	21
considerable	27	skull	24	covering	21
containing	27	starch	24	digested	21
cough	27	area	23	elastic	21
dissolve	27	careless	23	enemies	21
narcotic	27	contact	23	flat	21
outer	27	enamel	23	gradually	21
severe	27	greater	23	hygiene	21
signal	27	malaria	23	knowledge	21
similar	27	moving	23	largely	21
smoking	27	odor	23	operation	21
tendon	27	outdoor	23	preventing	21
walking	27	passage	23	sac	21
worker	27	playing	23	sanitary	21
brush	26	protoplasm	23	slowly	21
directly	26	pulse	23	standard	21
drinking	26	pus	23	surrounding	21
improve	26	scientific	23	thermometer	21
modern	26	sore	23	twice	21
older	26	treated	23	vision	21
passes	26	abdomen	22		

Below is a table containing 116 words arranged in alphabetical order, with their frequency, which do not occur in the Ayres or the Thorndike lists of 1,000 most commonly used words, nor do they occur in the Thorndike list of 10,000 most commonly used words.

activities	31	breathing	85	carries	27
alcoholic	38	burned	21	cavity	24
allowed	31	burning	31	changing	21
antitoxin	35	called	209	chiefly	22
arteries	55	calorie	30	cleanliness	44
bacteria	63	capillaries	34	commonly	24
bleeding	27	carbohydrate	38	communicable	21
bodies	49	carefully	44	containing	27

cooked	24	heating	22	rapidly	24
cooking	33	hygiene	21	reading	35
corpuscle	54	interesting	36	respiration	22
covered	24	keeping	43	retina	36
covering	21	largely	21	sac	21
digested	21	learned	53	saliva	22
digestion	61	living	78	scientist	30
digestive	42	longer	25	secretion	40
dioxide	62	looking	22	slowly	21
diphtheria	39	lymph	44	smaller	22
directly	26	making	58	smallpox	38
doing	35	malaria	23	smoking	27
drinking	26	membrane	46	stimulate	40
eaten	25	microbe	47	surrounding	21
eating	32	microscope	30	swimming	25
enemies	21	moving	23	taking	42
factories	31	narcotic	27	tendon	27
focus	29	needed	66	thoroughly	30
formed	49	older	26	tonsil	26
freely	24	opening	34	toxin	22
frequently	35	oxygen	136	trained	42
generally	25	particularly	22	training	54
giving	39	partly	22	treated	23
glasses	40	passes	26	typhoid	32
gradually	21	playing	23	using	45
greater	23	preventing	21	usually	121
greatest	22	properly	36	ventilation	22
growing	41	protein	89	vitamin	132
harmful	33	protoplasm	23	walking	27
having	35	quantities	22	working	48
hearing	48	quickly	31		

The word lists herein tabulated are but two of the many such interesting and valuable tables found in the investigation.

An interesting point of observation lies in the fact the word "hygiene," around which this investigation was conducted does not appear in either the Ayres or the Thorndike lists of 1000 most commonly used words, nor in the Thorndike list of 10,000 most commonly used words.

This investigation, which consists of 145 typewritten pages, may be found in the library of the University of Wisconsin.

Factors Which May Influence the Participation in Physical Education of Girls and Women 15-25 Years of Age

By Mary C. Baker

Department of Physical Education
Mary Washington College, Fredericksburg, Virginia

THAT team sports should be included in a program of physical education at the college level has been taken for granted for many years. Most teachers are so sure that this experience should be imposed on students that it has become a routine at most institutions. Yet in spite of efforts to put into effect this Utopian scheme, progress has been slight and a marked discrepancy continues between the mandatory requirement and actual practice. Contrary to expectations, girls in college do not engage in team sports unless forced to do so; and routine procedures developed to overcome this inertia effect no compromise between what is best and what girls prefer to do.

The proportion of students engaging in any but required classes is seldom more than one of every five. This lacks 80 per cent of meeting the theoretical standard. The teachers' task has, as a result, become one of trying to approximate habits of participation with the standards of attendance set up by administrators.

Observation of this process over several years fostered a conviction that it could never be effected. It seems impossible to serve the interest of more than a few girls in team sports such as hockey, soccer, and softball with existent procedures. Since their behavior appears to be universal and not characteristic in a few institutions a possibility exists that this is typical of most girls and women who have passed adolescence. This study was undertaken to find some reasonable explanation for this behavior.

PURPOSE

The study was developed on the premise that such behavior is normal and may be ascribed to certain definable causes. In the light of predetermined factors, the participation in physical education of a selected group of girls and women who were of college age, but not necessarily in college was examined. From an almost inexhaustable gamut of forces which may affect participatory behavior in physical education,

This article is an excerpt of a thesis submitted in partial fulfillment of the requirements for the degree of Doctor of Education in the Department of Health and Physical Education, School of Education, New York University, 1939. It was also presented before the Research Section of the Eastern District Society, A.A.H.P.E.R., May 1939, New York City.

eleven items were chosen to be used here. These were factors of a physical and psycho-physical nature, intimately associated with participation in physical education.

COLLECTION OF DATA

Data for the study were secured from 1150 subjects between the ages of fifteen and twenty-five. This restriction in chronological age was the primary one. The selection was qualified further by the inclusion of subjects from different occupational pursuits; these groups comprised girls and women enrolled in high schools, colleges, schools of nursing, business and professional organizations, and adult education classes.

All of the data were collected by means of a questionnaire-survey under the supervision of several assistants. These materials are shown below. Respondents were asked to furnish information on each and all activities in which they had engaged during the previous year. In addition, they supplied information on the following: height and weight, chronological and menarcheal age, and certain phases of their experience in and attitudes toward participation in physical education activities. The latter included the amount of participation, viz., the number of times a girl had taken part in the activity; the age when the activity had been learned; and whether or not it had been learned in school.

THE QUESTIONNAIRE

1. Your weight..... Your height..... Your age.....

2. Are you: A Nurse..... In College..... In High School.....

   In Adult Education Classes..... A Business Girl.....

3. Have you played on a team: Varsity..... Class.....

   Which sports: .....

4. At what age did you first menstruate? .....Years

5. What do you enjoy doing most?.....

6. What do you enjoy doing least? .....
   Why:

7. Check your reasons for liking
   - Improves the health
   - Makes one feel better
   - Hope to become a champion
   - Men prefer athletic girls
   - Fondness for all athletics
   - Enjoy wearing gym clothes
   - Hope to break a record
   - Enjoy displaying my skill
   - Easier than other subjects
   - Takes me out of doors
   - Any others:

8. Check reasons for disliking
   - Feel too weak afterwards
   - Am afraid of getting hurt
   - Men prefer dainty girls
   - Feel awkward
   - Prefer other kinds of activity
   - Boys ridicule our efforts
   - Possibility of being considered a tomboy
   - Takes too much time
   - Gym clothes are unbecoming
   - Health is poor
   - Any others:

Check *everything* you did during the *past year* in your *free time*		Write in No. of times	Check if you learned in school	Write in your age when you learned
Cooking	Sample:			
Singing	Stringing Beads	2	x	6
Play an instrument	Skiing	16		15
Sewing and Millinery	Baseball			
Auto riding	Tennis			
Amateur Dramatics	Volleyball			
Writing letters	Basketball			
Collecting things	Soccer			
Photography	Croquet			
Study (not schoolwork)	Horseshoes			
Listening to radio	Swimming			
Reading non-fiction	Archery			
Reading magazines	Bowling			
Reading newspapers	Aesthetic Dancing			
Indoor card-games	Pingpong			
Visiting friends	Gym Classes			
Weaving	Field Hockey			
Painting and Drawing	Track & Field			
Knitting & Crocheting	Fencing			
Metal, leather work	Hiking			
Attending concerts	Boating & Canoeing			
Attending movies	Camping			
Attending legitimate theatre	Coasting			
Attending lectures	Roller Skating			
Attending parties and socials	Ice Skating			
Attending dances	Bicycling			
Attending lodge, club outing	Horseback Riding			
Attending church	Nature Study			
Visiting Museums	Watching Football			
Sightseeing	Watching Tennis			
Dates	Watching Baseball			
Shopping	Picknicking			
Add others:	Day Outings			

SUMMARY OF FINDINGS

The data revealed that certain of the factors were more significant than others in their influence on participation in physical education activities. These have been arranged in Table I in order of importance.

The three factors exerting a real influence on the greatest number of girls were academic environment, menarcheal age, and chronological age. Deviations from the menarche and length of experience, although not significant,* suggest a great influence on participation.

Of the remaining six factors, one, skillful performance, seemed to exert a fair amount of influence, whereas the others exerted a negligible amount insofar as these data were concerned.

* According to Garrett, a critical ratio must be greater than 3.0 to signify a real difference. The critical ratio obtained in these cases was less than three.

TABLE I
SIGNIFICANCE OF THE INFLUENCE OF ELEVEN FACTORS ON PARTICIPATION

Factor	Significance of Influence
Academic environment	Real
Menarcheal age	Real
Chronological age	Real
Deviations from menarche	Great
Length of experience	Great
Skillful performance	Fair
Gymnasium costume	Negligible
Bodily weight	Negligible
Team membership	Negligible
Formal training	Negligible
Time spent in activity	Negligible

Table II depicts on a percentage basis three different attitudes expressed by subjects toward physical education. The variation between the several groups in their respective attitudes suggests interesting possibilities. Basing an opinion on the size of the percentages "liking physical education," it might be assumed that participation should be higher than it is. In only two instances did the percentage fall below 33. This idea is further substantiated by the fact that the size of the groups expressing "dislike" was large only among the "awkward" and the "twenty-five-year-old" groups. Both of these are extremes, however, and not the average met in the college situation. Conclusions based on this material alone are not sound.

TABLE II
PERCENTAGES OF GROUPS EXPRESSING ATTITUDES TOWARD PHYSICAL EDUCATION

Deviate Group	Liking	Disliking	Indifference
Varsity members	62	8	30
High School Girls	54	10	34
Skillful group	53	8	39
15-year-olds	52	11	37
Underweight group	51	23	26
Overweight group	46	16	38
College women	44	18	38
Business women	36	13	51
Non-team	36	10	54
Awkward group	35	26	39
Student nurses	21	8	61
25-year-olds	20	25	55

However, one way of solving this enigma appears by taking into consideration the size of the percentages in the third column, those of indifference. In almost every instance, the size of the percentage "liking" is counterbalanced by that representing "indifference." If this does not occur in the same group, it happens in another.

Another explanation is that the average percentage of those "liking" is smaller than that of those who express no definite attitude—indif-

ference. The unalterable effect of this condition appears to be that the combination of those "disliking" and those who are indifferent is greater than those "liking." This condition would automatically throw the balance away from "liking" of which participation is the logical concomitant. Since neither of the two former attitudes engenders participation, decreased participation among girls and women who are in college is to be expected.

The following summary was derived from data resulting from the replies to the questionnaire survey.

1. Subjects showed unquestionable preferences for activities which are not physical education.

2. The preferences in physical education activities were not typical school activities.

3. Preferences in physical education were characterized as non-competitive, individual, and unsupervised.

4. Amounts of participation in physical education varied inversely with chronological age. Decrease in participation is a gradual process, accelerated slightly in the beginning and tapering off as age increases.

5. Girls who reached the menarche after fifteen participated more extensively in physical education activities than those who reached it earlier.

6. Environmental influence was discernible in participatory habits. School environment seemed conductive to larger participation; non-academic to smaller.

7. The range of participation was small. It was concentrated in a few activities.

8. Familiarity with an activity tends to increase participation in that activity.

9. The origin of learning physical education activities does not influence voluntary participation in them.

10. Deviations in bodily weight had no apparent influence on participation in physical education.

11. Participation in physical education activities was not affected appreciably by appearance in gymnasium costume or capability associated with participation.

12. Extra-class team membership did not condition participation.

13. The greater the temporal deviations from the menarche, the smaller the amounts of participation in physical education. It seems to be the increase in chronological age, which parallels these deviations, however, which colors the results.

14. The greatest number attended movies; this was larger than in any other activity. The smallest number participated in an activity which was designated as physical education.

15. The percentage which swam was larger than that in any other *physical education activity.*

16. Expenditure of time tends to be concentrated in one physical education activity.

CONCLUSIONS

The conclusions were based upon the specific findings resulting from the study.

1. Girls and women have specific habits of activity. These habits are modified as the girls mature; they tend to become less strenuous and more mechanized with the emphasis on the role of spectator.

2. Factors which produce these changes seem to be of a social and physical origin. Chronological and menarcheal ages affect modifications in participatory behavior which are opposite. Greater menarcheal age prolongs particiation in physical education, whereas it is decreased with greater chronological age.

Occupational environment is a strong determinant of participation in strenuous and competitive games and sports. Absence of school authority and supervision reduces participation to a fraction of the already small amount characteristic of girls in college.

3. The psycho-physical factors investigated in this study seem to exert very slight influence on participation in physical education activities. Attitudes or feelings concerning participation do not regulate it so much as they reflect the influence of other causes which do.

4. The heterogenous character of the activity patterns fosters a conclusion that the voluntary activity habits of girls and women are largely unpremeditated. For most of them, participation in physical education is at best a capricious arrangement.

Characteristic Positions in the Field of Aquatics

By James William Clemenger
Aquatic Director, Y.M.C.A.
Central Parkway Branch, Cincinnati, Ohio

THE PROBLEM

OVER recent years men have been hired as swimming instructors, coaches, directors, field representatives, and in a wide assortment of combinations that involve responsible educational relations to aquatics. It was the purpose of the author to investigate the vocational possibilities in this field of endeavor. The aim of the study is to describe some characteristic positions in the field of aquatics, as they now exist in the United States, and by so doing make it possible to suggest some vocational opportunities in this branch of health, physical education, and recreation.

It was of interest to the author to investigate not only the position itself but how the position was held, what were some of the qualifications necessary to hold said position, and what was the general background of the men already in the field? Where did they receive their aquatic education? Were they college men? What degrees did they hold? What aquatic experience did they have? Were they ex-swimmers? Did they have experience and knowledge of a broad aquatic program? Were their positions stable and sufficiently remunerative to support a family? Are there worth-while professional[1,2] aquatic positions?

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[1] Hedley S. Dimock, "The Marks of a Profession" (New York: Association Press, 1937) pamphlet. "(1) A profession rests upon a social function, distinct from other functions, that is basic, important, and relatively permanent. (2) A profession possesses a distinctive or specialized body of knowledge and skill, a science, and an art. (3) A profession demands a specialized or professional preparation in addition to general education, for its practitioners. (4) The organization of the practitioners into guilds or societies is another clearly discernable mark of a profession. (5) A profession formulates and applies standards that govern the practice of the profession in the community. (6) A profession is motivated by a social spirit and purpose. (7) A profession implies a personal standard of workmanship characterized by sincerity and intellectual integrity."

[2] T. K. Cureton, Jr., "Professional Versus Lay Leadership in Aquatics," *Beach and Pool*, 8 (Feb. 1939) 12; 8 (March, 1939) 10. "(1) In New York City aquatic instructors in the schools must be college graduates, regularly qualified for teaching positions with a minimum of 20 semester hours of professional work in education, and also be able to demonstrate relatively high success on a 3-hour written examination, as well as a practical examination. (2) The National Aquatic Committee of the Y.M.C.A.'s of the United States has established a set of standards which place the 'Aquatic Director' and 'Aquatic Instructor' positions (for men and women) on a strictly professional basis, thus separating them from the lay-leadership designation of 'Aquatic Leader-Examiner.' (3) The National Recreation Association, also in the past year, has published standards for community recreational workers to include: Specialist or Special Teacher, minimum age 22, college graduation recommended, salary $100 to $250 per month; Manager of

Limitations of the Problem.—Women aquatic leaders were omitted from the study. Only the professional leaders, samples of seven areas, or types of aquatic leaders were studied. Only aquatic leaders as described by the persons themselves through the questionnaire were studied.

As has been said before there shall be no attempt whatsoever to predict trends, set up standards, or establish a criteria for professional aquatic leaders. The purpose of this study is solely to describe certain conditions that now exist in the field. It is a horizontal study of several areas of possible aquatic positions and makes no claim whatsoever to be a complete survey of the field.

METHOD OF RESEARCH

Procedure for Securing Descriptions of Positions.—A preliminary inquiry form was sent to men already in the field for the purpose of determining the possibility of the study, the attitude of the men toward such a study, the elimination of possible duplication of a similar work, and the establishment of an effective mailing list for the proposed questionnaire.

A brief summary of the *preliminary inquiry* form returns is given here:

Preliminary forms mailed	320
Preliminary forms returned as requested	132
Preliminary forms answered by letter	4
Total number of replies	136
Percentage of preliminary forms returned	42.50

Three preliminary forms were returned by the post office officials because the people left no forwarding address.

The mailing list of the *preliminary inquiry* form was found in the following sources:

The National Collegiate Athletic Association Official Rules, for Swimming, Fancy Diving and Water Polo '39, which gave names of aquatic men in colleges, universities, high schools, and private schools.

The Amateur Athletic Union of the United States Swimming Diving and Water Polo Rules book, which provided names of aquatic men in schools, colleges, and social organizations that were members of the Amateur Athletic Union.

Certain officials of the youth-serving organizations, such as the National Recreation Association, the Boy Scouts of America, the American National Red Cross, the American Association for Health, Physical Education, and Recreation, the Boys' Clubs of America, the Jewish

Swimming Pool or Bathing Beach, minimum age 25 years, at least one full year experience as guard or swimming instructor, college graduation recommended, salary $250 to $350 per month. . . . (11) Civil Service—(*a*) State: residence one year, file application, physical examination, minimum age 21 years, Red Cross Aquatic Instructor's Certificate. Salary not given. Both sexes. (*b*) City: residence six months, file application, physical examination, minimum 21 years, Red Cross Aquatic Instructor's Certificate, salary $3.50 per day, six-day week in parks. Both sexes."

Welfare Board, the Salvation Army, and the Young Men's Christian Association. Copies of the form were sent to these officials for the purpose of having them identify the leaders in their respective organizations who had professional responsibilities for conducting or supervising aquatic programs.

Names of men mentioned in recent issues of *Beach and Pool,* names of men known to the author, and names of men found in the files of Dr. Thomas K. Cureton, Jr., of Springfield College, sponsor of the study, were also added to the list.

As the *preliminary inquiry forms* were returning the final questionnaire was being prepared, which in turn was distributed by the author to the men attending the Fourth Annual Ft. Lauderdale Aquatic Forum, December 17 to January 2. Attendance at this conference was of great value in securing personal interviews.

Upon return from Florida another mailing list was constructed from the original one and from material gathered in the *preliminary inquiry form.* An explanatory card was inserted with the questionnaire to facilitate greater returns.

The final questionnaire was mailed February 6, 1939. On March 6, duplicate copies of the questionnaire and a follow-up letter setting March 25 as the closing date for the study were mailed to all candidates that failed to reply to the first request. Because of his prestige in the field and his sponsorship of the study, Dr. Cureton wrote the follow-up letter. The write-up of the study was undertaken after March 25.

Analysis of Data.—The *preliminary inquiry form* was treated first. Each question of the form was arranged on graph paper and tabulations made from the returns. The key to the tabulations of the form and interpretations is given in Chapter III.

When the study of the final questionnaire was made, the plan of the write-up was to follow through the four steps: *chronological age and marital status, educational background, aquatic experience,* and *vocational status,* of each candidate that returned a questionnaire.

When the mailing list of the final questionnaire was constructed, the men were classified into seven groups and each of these groups constitutes a chapter. They are:

Chapter IV	The College Aquatic Men
Chapter V	The High School Aquatic Men
Chapter VI	The Y.M.C.A. Aquatic Men
Chapter VII	The Aquatic Men In Parks and Departments of Recreation
Chapter VIII	The Red Cross Aquatic Men
Chapter IX	The Aquatic Men in Athletic Clubs
Chapter X	A Miscellaneous Group of Aquatic Men

At the end of each chapter there are a master chart and a salary chart upon which the question headings and sub-headings of the ques-

tionnaire have been projected in relation to the four major items mentioned above. The master and salary charts are the crux of the study, and from them the discussion material has evolved. It is on these charts that each return may be traced in its entirety, and all the data concerning the individual cases may be found on them.

Limitations of the Research Method.—It was impossible for the author to interview personally all of the aquatic leaders or all the organizations conducting aquatic activities. Even when a number of the men were interviewed at Ft. Lauderdale, Florida, it was quite apparent from their reactions that an impersonal approach was preferred and would be better. They did not want to disclose intimate personal data.

The questionnaire method was imperative, and even then a special plea and an assurance that the reports were to be considered confidential had to be made to facilitate more returns. One device used was to permit the questionnaires to be returned unsigned; curiously enough all but one of them were returned fully signed.

Returns from questionnaires are sometimes open to criticism on the basis of reliability. The present study is no exception. It is impossible to predict the validity of this study on the basis of reliability and adequate sampling from the field of aquatics as a whole. Therefore the problem was treated as a study of some positions in each of the seven areas of vocational possibilities.

The study is a horizontal research over seven areas and does not assume an adequate or representative range in each or any of the seven groups. The study covers some positions. It was deemed wise to do a horizontal research to determine other opportunities for research in each of the seven areas. Further study should include only one or two areas with a sample which is adequate, random, and representative.

RETURNS SECURED

Questionnaire Returns.—The following is a brief report of the questionnaire returns:

Number of Questionnaires in the first mailing	203
Number of Questionnaires added to the follow-up mailing list	11
The percentage of returns at the time the follow-up letter was mailed	42.36%
Total number of Questionnaires mailed	214
Total number of replies to the Questionnaire	138
Number of returns obtained at the Fourth Annual Ft. Lauderdale Aquatic Forum	19
Number of replies returned by mail	119
Total percentage of returns including the Ft. Lauderdale group	64.48%
Percentage of returns by mail alone	55.60%

SAMPLING REPORT AND SALARY RANGES

Classification	Number Questionnaires Mailed	Number Questionnaires Returned	Percentage of Returns	Salary* Ranges	
College Men	40	29	62.50	$1020**	$5175
High School Men	46	35	76.08	500–	4000
Y.M.C.A. Men	30	24	80.00	900–	5400
Parks and Departments of Recreation Men	30	14	46.66	300–	3780
Red Cross Men	15	7	46.66	1800–	4200
Athletic Club Men	10	7	70.00	2400–	5200
Miscellaneous Group of Aquatic Men	43	22	51.16	1620–	5000
Total	214	138	64.48 Total percentage of returns		

* Some of the men did not report salary data.
** Plus tuition.

SUMMARY AND FINDINGS

Title of Position.—It was difficult to attempt a classification of aquatic men on the basis of their titles because there were so few full-time men, only three in the College Group, two in the High School Group, nine in the Y.M.C.A. Group, one in the Athletic Club Group, and seven in the Miscellaneous Group. The Red Cross positions are a combination of First Aid and Water Safety, and the Parks and Departments of Recreation Group did not indicate a full-time aquatic position.

The colleges used such titles as professor, director of athletics, coach and instructor of Physical Education; the High Schools, director of physical education, teacher-coach, and instructor of Physical Education. The Y.M.C.A.'s used such titles as aquatic director, physical director, and secretary; the Departments of Recreation, director, supervisor, and instructor. The Red Cross used the title of director of first aid and lifesaving. The Athletic Clubs used the titles, director, coach, and instructor. The Miscellaneous Group is heterogeneous and one should refer to Chart VII-A for the titles of this group.

Chronological Age and Marital Status.—The mean ages for the seven groups were College thirty-seven, High School thirty-six, Y.M.C.A. thirty-two, Parks and Departments of Recreation thirty-one, Red Cross thirty-four, Athletic Club forty-five, and the Miscellaneous group thirty-eight years of age.

The men reporting that they were married were College, twenty-one; High School, twenty-four; Y.M.C.A., fifteen; Parks and Departments of Recreation, six; Red Cross, five; Athletic Clubs, six; and the Miscellaneous Group, ten.

The *modes* for the number of children in the family of each of the above groups in order were, ∪, 0–2, 0, 0, 0, 0, and 0–2. The range of

children per family for the entire study was one to five, which indicates comparatively small families.

Just how much these data contribute to the economic status of the aquatic men is not to be questioned here nevertheless it is an influencing factor.

Educational Background.—All of the men had a secondary education. The number of college graduates for each of the groups was College, twenty-four; High School, twenty-four; Y.M.C.A., nine; Parks and Departments of Recreation, seven; Red Cross, three; Athletic Club, two; and the Miscellaneous group, six. Some of the men replied by letter or otherwise and gave no information. To check returns one must refer to the Master Charts or the chapter of each group.

The predominant degrees were the B.S., A.B., and the B.P.E. degrees. Seventeen of the College Group had graduate degrees, nine of the High School, none of the Y.M.C.A.'s, one of the Parks and Departments of Recreation, three of the Red Cross; none of the Miscellaneous Group held graduate degrees. The M.A. degree was the predominant graduate degree, and there were three Ph.D. degrees and one D.Ed. degree. One of the Ph.D. degrees was in the High School Group; the others were in the College Group.

The need for a college degree to hold a college or high school position is an institutional pre-requisite and not an aquatic one. The New Y.M.C.A. Aquatic Program now requires college graduation for certification of Aquatic Directors with a major of 30 semester hours in Health, Physical Education, and Recreation. The other groups did not indicate college requirements.

The number of men having taken formal accredited college courses in aquatics in each group was: College, twelve; High School, fifteen; Y.M.C.A., two; Parks and Departments of Recreation, six; Red Cross, two; Athletic Club, one; and the Miscellaneous Group, five. This shows a definite lack of college aquatic courses in the curriculum chosen by these men. This may be due to several factors such as, no facilities available in the college they attended or they did not elect the courses when in college.

The number of men having taken informal non-college accredited courses in aquatics was, in relation to the number of men having taken college accredited courses, quite high. Of the men that had taken informal non-college accredited courses in aquatics, there were in the College Group, twenty-five; High School, twenty-nine; Y.M.C.A., nineteen; Parks and Departments of Recreation, nine; Red Cross, eight; Athletic Clubs, two; and the Miscellaneous Group, five.

Aquatic Experience.—Most of the men at some time or other were members of swimming teams in High School, College, the Y.M.C.A., or some other organized team. Many of these men swam on several of the teams mentioned while others had no swimming team experience.

Most of the men at some time or other had received some kind of aquatic recognition from college aquatic organizations, the Y.M.C.A., the Red Cross, or the Boy Scouts. This recognition may have been in the form of tests passed and certificates received, membership in an officiating body, team awards, etc., of a major or minor significance.

With the exception of the Red Cross all of the groups indicated that the men were more proficient and capable of teaching swimming, diving, and life saving than they were boating, rowing, canoeing, sailing, surfboard operation, motor boating, sculling (boat), and aquatic pageantry. The Red Cross men considered themselves about equally proficient and capable of teaching all of the activities. This indicates to the author that for the most part the aquatic knowledge and experience of these men is limited quite closely to the first three activities. They lack ability and knowledge of a broad aquatic program and tend to confine their work to pool aquatics. The reason for the Red Cross men claiming proficiency and ability to teach all the activities is undoubtedly due to the inbreeding of men from their own National Aquatic Schools where a broad aquatic program is offered for a short period of time.

Vocational Status.—Twenty of the college men submitted salary data with mean salary of $2,995.52. The mean term of service for the entire group was eight years. Four Red Cross men submitted salary data with a mean salary of $2,750. The mean term of service for this group was eight years. Five athletic club men submitted salary data with a mean salary of $2,628.57. The mean term of service for the entire group was sixteen years. Twelve men in the Miscellaneous group submitted salary data with a mean salary of $2,518.58. The mean term of service for the entire group was six years. Thirty High School men submitted salary data with a mean salary of $2,516.68. The mean term of service for the entire group was nine years. Ten men in Parks and Departments of Recreation submitted salary data with a mean salary of $1,996.29. The mean term of service for the group was six years. Twenty-two Y.M.C.A. men submitted salary data with a mean of $1,954.32. The mean term of service for this entire group was five years. The cents notations have been purposely omitted from the salary charts to save space.

Some of the larger colleges offer a life insurance policy and retirement fund for their employees. State schools have State tenure laws; the rest of the colleges offered only "contract," "satisfactory work," "conduct" and sometimes "alumni pressure," as security of position to their employees.

The high schools offered much the same security with more state control and less alumni pressure and no individual school insurance or retirement funds. The Y.M.C.A. had its own rules and regulations in its personnel policies, and security of position was "satisfactory work."

Civil Service entered into the security of some in the Parks and Departments of Recreation. The Red Cross had its own national program of security in later life. The Miscellaneous Group is very heterogeneous and had, in addition to the customary security plans rulings of Health Departments, Physical Therapy, Congress, and local organization control. It was very difficult to obtain definite information on the security of the men's positions; they did not seem to know.

In one or two rare cases aquatic knowledge provided increments of about $100 or more over that of fellow workers in the high schools, Y.M.C.A.'s, Parks, and Departments of Recreation. This occurred usually when the person was hired specifically for his aquatic knowledge and had full-time work in aquatics.

CONCLUSIONS

1. There is a large variety of aquatic positions, some having very distinctive professional characteristics, such as college coaches, college aquatic directors, high school coaches and teachers, Y.M.C.A. aquatic directors, Red Cross field representatives, and others.

2. Most of the aquatic positions in this study are not full-time aquatic work but are a combination of many duties. Only 15.94 per cent indicated they were full-time aquatic workers.

3. Some of the outstanding characteristics of the aquatic men studied are:

All of the men had a secondary education.

Most of the men were between thirty and forty years of age.

Most of their families were very small, and many had no children at all.

4. An aquatic director in a school or college may have faculty status when he meets the educational qualifications of the school or college at which he is employed.

5. Only 31.15 per cent of the men indicated they had formal technical training in aquatic methods. At present there are men both with and without formal college technical training in aquatics.

6. The salary information may lead one to believe that high educational qualifications guarantee higher salaries. This is not always true in every individual case although it is an encouraging generalization for the groups studied. In some cases the aquatic knowledge and experience of the man was known to have provided an increment of $100 or more above that of fellow workers in the high schools, Y.M.C.A.'s, Parks, and Departments of Recreation.

7. This area of professional leadership is definitely being up-graded with the establishment of standards comparable to those in the field of health, physical education, and recreation. The new Y.M.C.A. aquatic leadership standard is a specific example.

A Study of Recreational Programs in Rural Schools

By Margaret E. Brewster
Instructor, Michigan State Normal College
Ypsilanti, Michigan

THE purpose of this study is to report the results of a questionnaire concerning recreational programs in the rural schools of Washtenaw County, Michigan. One hundred twenty-five questionnaires were sent to rural teachers during February and March of 1939. Of this number, 67 were returned.

Results of this questionnaire were divided into the following subtitles: (1) General description of rural schools including playgrounds, size of schools, and pupil distribution; (2) equipment; (3) recreational programs; (4) school clubs and their support of recreation; (5) community relations; (6) health conditions; (7) teacher preparation; (8) literary references used; (9) general conclusions; and (10) recommendations.

GENERAL DESCRIPTION OF SCHOOLS

Pupil Distribution.—There were a total of 1079 pupils enrolled in the schools that returned questionnaires. Of these, 643 were boys and 436 were girls. The first grade of both sexes had twice as large a membership as did any other grade. The average enrollment per school was 10 pupils.

Distance of Pupils from School.—None of the schools investigated had a school bus in which to transport pupils.

Distance traversed ranged from one-quarter of a mile to two or more miles. The majority of pupils came to school from three-quarters of a mile to one mile.

Playground Description.—Under this heading the factors of size, condition, and location were included.

1. Size. Thirty-four schools had playgrounds of one acre or more, 10 had from one-quarter of an acre to one-half an acre and one had less than one-quarter of an acre. The remaining schools did not answer this question.

2. Condition of playground. Fifty-two schools replied that their playgrounds were on level ground, while 14 answered in the negative. Contrasting to this item was the finding on surfacing. Fifty-two schools had playgrounds which were not surfaced in any way and were consequently unavailable for use in wet weather, while 13 said their play-

grounds were surfaced. Those that spoke about the nature of their surfacing mentioned gravel and sod.

3. Location of playground in relation to roads. Forty-three schools were situated on main highways which carried a great deal of traffic. Twenty of these were protected by fences. Twenty-three were on roads which were not main highways and 19 of these were unfenced. Several schools were bounded on two sides by main roads and a few were located on a corner where three roads met.

School Facilities.—Fifty-six schools had one room, three had two, and one school had four or more. Seventeen replied that they had space for indoor games and six added that they had basements equipped for recreational activities. Twenty-eight schools indicated their schools to be equipped with movable desks.

EQUIPMENT

Playground Equipment.—A check list was provided for this question, with space for the addition of equipment not listed. Five articles were common: (1) baseball bats, (2) softballs, (3) softball diamonds, (4) swings, and (5) teeter-totters. The minimum and maximum number of these articles present in each school ranged from one to three bats, one to four balls, one to two diamonds, two to six swings, and two to six teeter-totters. A complete list will be found in Table I.

TABLE I

PLAYGROUND EQUIPMENT

Equipment	Frequency	Equipment	Frequency
Ball bats	56	Volleyball nets	6
Softballs	49	Giant strides	4
Diamonds	43	Basketball goals	4
Swings	43	Rings	3
Teeter totters	43	Soccer balls	2
Volleyballs	14	Rubber balls	2
Chinning bars	13	Deck quoits	1
Sand piles	12	Jumping standards	1
Footballs	9	Horseshoe pits	1
Merry-go-rounds	8	Pitching targets	1
Skipping ropes	8	Ocean wave	1
Slides	7	Croquet sets	1
Basketballs	6		

Indoor Equipment.—A check list was also used for securing information on indoor equipment. Fifty schools out of the 57 had pianos while 37 had victrolas. There was a total of 552 records with an average of fifteen records per school. Three schools had radios. Next in frequency came checkers and the remaining articles dropped in number considerably. The complete returns are given in Table II.

None of the schools had a ping-pong table. Several replies mentioned card games such as Flinch, Lotto, and Authors, but the majority

TABLE II
INDOOR EQUIPMENT

Equipment	Frequency	Equipment	Frequency
Pianos	50	Anagrams	3
Checkers	43	Aerial darts	2
Victrolas	37	Nine pins	2
Pick-up-sticks	16	Beads	1
Bean bags	16	Ski ball	1
Card games	15	Tiddley-winks	1
Combination games	10	Blocks	1
Ring toss	8	Box hockey	1
Bird-minton	7	Monopoly	1
Puzzles	6	Sand table	1
Dominoes	5	Dolls	1
Ping-pong paddles	4	Marbles	1
Horseshoes	3	Parchesi	1
Radios	3	Chess	1

failed to specify what particular games they had. Combination games are board games that have a variety of games in one. Checkers included both the regular checker board variety and Chinese Checkers.

Twenty-five schools had no money whatsoever allotted them by the school board. Twelve schools had from $2.50 to $5.00; eleven from $5.00 to $10.00; and two had from $15.00 to $25.00. In fifteen schools the teacher spent $2.50 of her own money, in nine she spent $2.50 to $5.00, and in two $5.00 or more.

Nine teachers indicated they spent nothing for equipment. The remainder failed to answer this question. Eighteen schools stated that parents helped financially while 21 had equipment furnished by parents.

RECREATIONAL PROGRAMS

Time Allotment.—Sixty schools had recesses for older children between 10:30 and 10:45 in the morning, while 49 had an additional recess at 2:30 to 2:45 in the afternoon.

Fifty-six schools had recesses at the same hour in the morning for the younger children and 40 also had one at the same afternoon hour as the older children. Only 4 schools had a 30-minute play period while 3 had a 45-minute period. There were very few schools that had different periods for the older and younger age groups. Most of the schools also had a noon period after the lunch hour.

Supervision.—Twenty-five teachers stated that they always supervised these periods, 16 sometimes directed them, 11 were managed by the pupil leaders, and 11 had no direction. The remainder did not answer this question. Ten schools indicated that the children stayed after school was dismissed for play activities.

Pupil Interests of Older Age Groups.—Baseball was by far the most popular outdoor game of the older age groups. The frequency of various games is shown in Table III.

TABLE III

OUTDOOR GAMES

Game	Frequency	Game	Frequency
Baseball	48	Soccer	2
Tag games	11	Cops and robbers	2
Prisoner's base	11	Relays	1
Touch football	11	Steal the stick	1
Hide and seek	9	Dodgeball	1
Pom-pom-pullaway	7	Duck on the rock	1
Red light	6	Volleyball	1
Fox and geese	4	New Orleans	1
Red rover	3	Swinging	1
Back-door, front door	3	Last couple out	1
Andy over	3	Snowball	1
Ice skating	3	Cat in the bag	1
Dixie	2	Keep away	1
Sliding	2	Tappy on the ice box	1
Ice hockey	2	Bull in the ring	1

Checkers was the most popular indoor game of the older pupils and the relative drop was not so great to the next most popular game (see Table IV).

TABLE IV

INDOOR GAMES

Game	Frequency	Game	Frequency
Checkers	16	Ring toss	2
Musical chairs	7	Cats meow	2
Hide the chalk	7	Tea kettle	1
Combination games	7	Still water	1
Fruit basket upset	6	Pussy in the corner	1
Tag games	5	Puzzles	1
Bean bag games	4	Priest of Paris	1
Guessing games	4	Train	1
Square dances	4	Book of magic	1
Blackboard games	3	I lost my sheep	1
Singing games	3	Scatter	1
Dog and the bone	3	Old cat	1
Hop scotch	2	Shuffle board	1
Bird minton	2	Boxing	1
Blind man's buff	2	Clap in, clap out	1

Pupil Interest of Younger Age Groups.—The favorite outdoor games of the younger children were (1) hide and seek, (2) tag, (3) baseball, (4) swinging and teeter-tottering, and (5) London bridge (see Table V).

TABLE V
OUTDOOR GAMES

Game	Frequency	Game	Frequency
Hide and seek	15	Cowboy	1
Tag	13	Loopy-loop	1
Baseball	11	Old-fashioned school	1
Swinging, teetering	7	Dixie	1
London bridge	7	Tappy on the ice box	1
Jumping rope	5	Drop the handkerchief	1
Hop scotch	3	Brownies and fairies	1
Pom, Pom, pullaway	3	Dutch tag	1
Red light	3	Bull in the ring	1
Prisoner's base	3	Flying dutchman	1
Squirrel in the tree	2	Fox and geese	1
Sliding	2	Dodgeball	1
Cat and mouse	2	Good morning	1
Witch and jar	2	Puss in the corner	1
Hobby horse	2	Relays	1

Singing games and folk dances were the most popular indoor games along with checkers, while blackboard games were a close second, as may be seen in the complete tabulation in Table VI.

TABLE VI
INDOOR GAMES

Game	Frequency	Game	Frequency
Singing games	9	Puzzles	1
Checkers	9	Bingo	1
Blackboard games	7	Tag	1
Pick up sticks	4	In and out the window	1
Musical chairs	3	Nine pins	1
Hide the chalk	3	Dominos	1
Fruit basket	3	Priest of Paris	1
Marching	3	Jacob and Rachel	1
New Orleans	2	Dog and bone	1
Old cat	2	I spy	1
I lost my sheep	2	Farmer in the dell	1
Jacks	2	Pussy in the corner	1
Ring toss	2	Playing school	1
Guessing games	2	Blind man's buff	1
Relays	2	Poison	1
Button button	1	Bean bags	1
Snap	1	Bird minton	1

Activities Played and Those Supervised by Teacher.—The teacher was told to check those activities listed that her pupils played and to double check those she herself taught. She was also to add those activities not listed.

Eight activities lead in frequency of play: (1) schoolroom games, (2) baseball, (3) singing games, (4) rope skipping, (5) hopscotch, (6) marbles, (7) hiking, and (8) ice skating (see Table VII). Many schools were situated near lakes, rivers, or ponds where ice skating, swimming, and perhaps boating were possible.

TABLE VII
ACTIVITIES PLAYED

Activity	Frequency	Activity	Frequency
Schoolroom games	58	Track	5
Baseball	50	Soccer	5
Rope skipping	45	Basketball	3
Hop scotch	41	Touch football	2
Marbles	36	Coasting	2
Ice skating	34	Newcomb	2
Hiking	32	Hit-pin baseball	1
Swimming	16	Ice hockey	1
Horseshoes	9	Nine or ten pins	1
Volleyball	8	Kickball	1
Fieldball	7	Bicycling	1
		Box hockey	1
		Kite flying	1
	TEACHER SUPERVISION		
Singing games	39		
Schoolroom games	38	Track	4
Baseball	26	Marbles	4
Hiking	17	Swimming	2
Hop scotch	9	Coasting	2
Rope skipping	9	Fieldball	1
Ice skating	6	Basketball	1
Volleyball	4	Soccer	1

Interschool Activities.—These consisted of some interschool competition and an annual playday.

1. Interschool competition. There were twenty-two schools which had played baseball against other schools. All but two of these used both boys and girls on their teams. Other interschool events were track and football. These activities were listed once each and were limited to boys only.

2. Field Day in Ann Arbor. Each spring there is held in Ann Arbor, the county seat, a Field Day for rural schools in Washtenaw county. Fifty-two schools stated that they attended this annually. Four other schools attended a similar event held at Manchester, Michigan. These are for both girls and boys.

SCHOOL CLUBS AND THEIR SUPPORT OF RECREATION

A total of seven clubs were listed, with the 4-H Club far outnumbering the others in frequency, as shown in table VIII. Twelve of the organizations took an active part in promoting recreation.

TABLE VIII

Club	Frequency
4-H Club	27
Canning and Sewing Club	4
Future Farmers of America	3
Boy Scouts of America	3
Audubon Club	1
Junior Farm Bureau	1
Civic Health Club	1

COMMUNITY RELATIONS

Parent-teacher organizations existed in 24 schools. Parents were cooperative in promoting recreation in 32 schools. Community nights were held monthly in 10 schools and in 7 they were held less frequently, two or three times a year for the most part. Eleven schools played games during these community nights. Parent attendance ranged from 25 per cent to 100 per cent, with an average attendance of 70 per cent.

Three teachers stated that there was someone in the community who offered advice or aid on recreational problems. This aid was supplied by a (1) Parent-Teacher Association President, (2) 4-H Club Leader, and (3) W.P.A. Worker.

HEALTH CONDITIONS

Twenty-four schools had annual physical examinations, while at 11 they were given bi-annually. Of these, 29 were made by the county nurse, 5 by the family doctor, and 1 by a clinic.

Forty-nine schools had first-aid kits, although some teachers indicated that their equipment was inadequate. Seven schools listed frequent absences on account of sickness.

TEACHER PREPARATION

College Courses.—Twenty-three teachers had had a course in Rural School Games and while baseball was listed second in frequency of games played in rural schools, only three teachers indicated they had had any class instruction in this activity. The findings listed in this connection do not include participation in intramural activities. Thirteen teachers did not list the specific activities they had had (see Table IX).

TABLE IX
COLLEGE TRAINING

Course	Frequency	Course	Frequency
Rural school games	23	Baseball	3
Swimming	14	Recreational activities	2
Unclassified	13	Tap dancing	2
Tennis	10	Badminton	2
Elementary folk dancing	9	Hockey	2
Community recreation	7	Archery	1
Early elementary rhythms	7	Winter sports	1
Early elementary games	4	Track	1
Basketball	6	Modern dance	1
School games	5	Individual gym	1
Freshman gym	4	Bowling	1
Playground games	3		

Experience Outside of School.—Although some teachers listed more than one activity, it may be seen from the following still less than half had had experience outside of their college courses.

EXPERIENCE OUTSIDE COLLEGE COURSES

Activity	Frequency
4-H Club work	10
Scouting	7
Campfire Girls	7
General camping	7
Adult leadership class	2
Young people's organization	2
Girl reserves	2
Junior Farm Bureau	1
Recreational Training Camp at Walden Woods	1

REFERENCES USED

With the exception of the State Bulletin, there was a wide variety of references used with little frequency of occurrence. Ten teachers omitted the titles of the books they used. The majority of teachers had only one or two references on hand. Several teachers listed material that was out-of-date.

Eighty-nine references were given with an average of 1.3 books for each teacher. A complete reference list is given in Table X. Rank refers to rank in order of frequency.

TABLE X

REFERENCES USED

Author	Title	Frequency	Rank
Bancroft, Jessie	Games for Playground, Home, School and Gymnasium	3	5
Birchard Co.	Twice 55 Games	1	7
Canfield	What Shall We Do Now?	1	7
	4-H Club Bulletin	3	5
	County Commissioner's Material	4	4
	County Normal Material	1	7
Cromie	Dumb Bell and Marching Drills	1	7
	Encyclopedia	1	7
Fretwell, J. H.	Play It—Days of Games for Children	2	6
Fullerton	Elementary Music	1	7
Gardner	Bulletin 231—Dept. of Labor	2	6
Garman, R.	Games, Pastimes, and Amusements	1	7
Girl Scouts	Handbook	1	1
La Salle, Dorothy	Play Activities for El. School	2	6
Lowth	Everyday Problems of County Teacher	1	7
Lund and Duggan	P.E. for Rural Schools	9	2
Michigan Education Assoc.	Journal	1	7
Mason and Mitchell	Active Games and Contests	3	5
Mason and Mitchell	Social Games for Recreation	1	7
May, Dr. George	Physical Training Program	1	7
	Michigan Normal College Material	3	5
	Newspaper (*Detroit News*)	1	7
Rodgers, Martin	Handbook of Stunts	1	7
Shredded Wheat Co.	P.E. for Rural Schools	2	6
Spaulding	Guide Books	1	7
Staley, S. C.	Games, Contests and Relays	1	7
	Michigan State Bulletin	18	1
Wood and Goddard	Complete Book of Games	1	7

RECOMMENDATIONS

1. More care should be taken in selecting games that are suitable for the different age groups. This may be complicated by the unequal distribution of numbers and sexes in the grades of rural schools which make it advisable to choose games that (1) appeal to all grades, (2) can be played by a small number with little equipment, and (3) take advantage of the equipment present.

2. Playgrounds should be surfaced and graded for drainage so that less time is lost because of inclement weather. Gravel with a quarter of an inch screening is suggested as surface material.

3. There is a definite need for movable seats in the classrooms to facilitate the playing of indoor games.

4. Greater advantage should be taken for securing the pupils' and parents' aid in making inexpensive equipment such as horseshoe pits, sandpiles, pitching targets, chinning bars, jumping standards, posts for nets, bean bags, vaulting bars, backboards for basketball.

5. It is suggested that school boards have an annual budget for the purchase of recreational equipment based on the recommendation of the teacher. The practice of rural teachers buying equipment from their salaries should be discouraged.

6. Every teacher should plan the recreational program for recesses and supervise these periods whenever possible. Part of this program should include the training of pupils as leaders. These leaders should assist the teacher and supervise the activities when the teacher is unable to be present.

7. The comparatively short distance traversed by the pupils from home to school would favor more opportunity for play after school. Student leaders could be used in this situation. The extent of this program would depend on the home demands made upon the pupils.

8. As many schools are located near lakes, streams, and ponds, it is suggested that the school utilize these facilities for activities and also supervise them because of the safety factor involved.

9. School clubs should take more of an active interest in sponsoring recreation within their clubs. The 4-H Club, most prevalent of all clubs listed, with one of its mottoes as *health,* should take a more prominent role in promoting rural recreation.

10. Greater support might be obtained from the community if the schools offered more community nights and included in their program, party games, mixers and square dances.

11. There is a definite need for a county supervisor of rural recreation in Washtenaw County, the function of whom should be to coordinate work in the county, to advise individual teachers, and to supply source material for a health and physical education program.

12. It would seem wise to extend the annual health examinations to cover the entire school population of the county.

13. All rural schools should own first-aid kits that are well-equipped and the teachers should be instructed as to the rudimentary rules of first-aid treatment.

14. It is suggested that college training courses in physical education for rural teachers include: (1) Rural School Games, (2) Elementary Rhythms and Folk Dances, (3) Baseball Technique and Umpiring, (4) Community Recreation.

15. The fact that 1.3 books was the average number of references used by rural teachers in Washtenaw county would seem to show that references are far from adequate. Rural teachers should have at least one good game book, one book of mixers and party games, and one book of elementary rhythms and folk dances. The revived interest in square dancing would make the possession of a book on this activity desirable. A few acceptable references are listed below.

Games—Mason and Mitchell, *Active Games and Contests;* La Salle, Dorothy, *Play Activities for the Elementary School.*

Folk Dances and Rhythms—La Salle, Dorothy, *Singing Games and Rhythms for the Elementary School;* Crampton, Ward, *The Folk Dance Book.*

Mixers and Party Games—Mason and Mitchell, *Social Games for Recreation.*

Square Dances—Ryan, Grace, *Dances of Our Pioneers.*

Acknowledgment.—The writer wishes to express her appreciation to her Rural School Games class of the winter term, 1939, for its assistance in preparing the questionnaire used, and for sending it to the rural teachers in Washtenaw County.

Studies for the Years 1937-1939 Listed in the Files of the Committee for Research for the National Association of Directors of Physical Education for College Women

By RUTH BASS, Ph.D.
The University of Texas

THE following listing of studies is presented by the Chairman of the Committee for Research and Study, the National Association of Directors of Physical Education for College Women. The Chairman, at the direction of the Association, has canvassed the members of the Association for studies completed or well under way by staff members or graduate women students. This canvassing has been conducted for the years 1937 through 1939.

The Chairman is responsible for the topic grouping of studies listed. Ambiguity in title made it difficult, in some instances, to feel certain of the most desirable topic-heading for studies. However, it seemed desirable to attempt a listing under topic-headings rather than a listing of studies alphabetically by school or by individual. Relative to the references for the studies as listed, in most instances where references were not reported, it would seem that the studies or research were thesis contributions.

ADMINISTRATION

Marshall, Violet B., University of California, Berkeley. "The Status of Physical Education for Women in Colleges and Universities." Ref.: RES. QUART., 7:3 (Oct. 1936) 3–13.

Neidhardt, Augusta W., Hunter College, New York, N.Y. "Pupil-load Carried by Department Chairman." Ref.: Study in progress.

ANATOMY

Ludlum, F. Elizabeth, Wellesley College, Wellesley, Mass. "The Prediction of Body Weight for College Women." Ref.: Master's Thesis, 1939.

Sibley, Katherine, Syracuse University, Syracuse, N.Y. "A Laboratory Manual for Anatomy Supplemented by Studies in Vertebrate Anatomy." Ref.: To be published 1939.

Thomas, Jesselene, University of Minnesota, Minneapolis. "Rate of Removal of Lactic Acid After Exercise Under Recovery Conditions Involving an Increase in Metabolic Rate and Circulation Rate." Ref.: Study in progress, 1939.

ANTHROPOMETRY

Beall, Elizabeth, Wellesley College, Wellesley, Mass. "The Relation of Certain Body Measurements in College Women to Success in Various Physical Activities." Ref.: Ph.D. Dissertation.

Cromwell, Gertrude E., University of Michigan, Ann Arbor. "A Study of Mass Weight Reports." Ref.: Thesis, June 1939.

Davis, Russel Sarah, Wellesley College, Wellesley, Mass. "Statistical Methods of Dealing with Anthropometric Data." Ref.: Conference Proceedings (Eastern).

Duffy, Ruth P., Boston University, Boston, Mass. "Report on the Angleometer."

Hardwick, Rachel, Boston University, Boston, Mass. "The Selection of Material for Anthropometrical Records." Ref.: Conference Proceedings (Eastern).

Kelley, Elizabeth, Stanford University, Palo Alto, Calif. "The Integrated Post Exercise Excess of Pulse Pressure and Heart Rate over Resting Condition Correlated with Other Evidence of Physical Fitness." Ref.: Master's Thesis, 1939.

Ludlum, Elizabeth, Wellesley College, Wellesley, Mass. "A Study of Frame-Weight Relationships of College Freshmen Who are in Excellent Health and Normal Nutrition and Who Represent a Country-Wide Geographical Distribution."

Ludlum, Elizabeth, Smith College, Northampton, Mass. "The Relation Between Body Weight and Certain Skeletal Measurements." Ref.: Study in progress.

McCall, Margaret, Alabama College, Montevallo. "An Age, Height, Weight Table for College Women." Ref.: RES. QUART. 8:1 (March 1937) 101.

McLane, Helen, University of Michigan, Ann Arbor. "A Statistical Study of Height and Weight with Special Reference to Weight of Women Entering University of Michigan from 1896 to 1932, Inclusive." Ref.: Thesis, August 1939.

Metheny, Eleanor, University of Iowa, Iowa City. "The Persistence of Anthropometric Type as Determined by Body Build Index."

Metheny, Eleanor, State University of Iowa, Iowa City. "The Variability of the Percentage Index of Build as Applied to the Prediction of Normal Weight for White Males from Six to Eighteen Years Old." Ref.: Thesis, 1938.

Miller, Marjorie, Claremont College, Claremont, Calif. "A Measure of Physical Fitness." Ref.: Master's Thesis, 1938.

Sauzle, Mrs. Catherine, Purdue University, Lafayette, Indiana. "The Physical Measurements of Purdue Freshmen." (1936–1939).

Shurmer, Jane Wells, University of California, Berkeley. "A Study of Physical Maturation of Girls during Adolescence." Ref.: Master's thesis, August 1938.

Sibley, Katherine, Syracuse University, Syracuse, N.Y. "Age, Weight, and Height Tables According to Typical Structures." Ref.: Conference Proceedings (Eastern).

Sibley, Katherine, Syracuse University, Syracuse, N.Y. "Weight, Height and Age Statistics." Ref.: Not in Print.

Wright, Elizabeth, Radcliffe College, Cambridge, Mass. "Values of Actuarial Mortality Tables as a Standard in Estimating Correct Age, Weight, Height Relation, Especially with Reference to Typical Structure."

AQUATICS

Arbuckle, Virginia, West Virginia University, Morgantown. "History of Swimming." Ref.: Thesis, 1937.

Clark, Rena, University of California, Berkeley. "The Relation of Certain Structural Measures of College Women to Speed in Swimming the American Crawl." Ref.: In progress.

Falconer, Jessie, University of California, Berkeley. "A Study of the Factors Making for Success in Swimming the Racing Back Stroke for Women."

Greenwood, Frances A., University of Alabama, University. "Swimming—A Bibliography from the Earliest Written Records through June, 1938." Ref.: Published by The H. W. Wilson Co., New York City, 1939.

Hanss, Marie J., University of Wisconsin, Madison. "Simultaneous and Successive Methods in Teaching Swimming Strokes to Beginners." Ref.: Master's Thesis, 1937.

Herne, Virginia Lee, University of Wisconsin, Madison. "A Survey of the Administration of Swimming Facilites and Swimming Programs for College Women." Ref.: Master's Thesis, 1938.

McArdle, Pearl, University of Michigan, Ann Arbor. 'The Effect of the Regular Use of the Swimming Pool on the Incidence of Upper Respiratory Infection." Ref.: Thesis, June 1938.

Osborne, Lola Lee, U.C.L.A., Los Angeles, Calif. "Measurement of Power Applied in Swimming Strokes." Ref.: Study, 1939.

Schwartz, Christine T., Wellesley College, Wellesley, Mass. "A Kinesiological Study of the Mechanics of Springboard Take Off in Diving."

Stahmer, Dorothy, University of Illinois, Urbana. "The Whole Versus the Part Method in the Teaching of Swimming." Ref.: Thesis.

Staley, Kate, Wells College, Aurora-on-Cayuga, N.Y. "Swimming, Methods of Teaching, Class Competition, and Tests." "Ref.: Conference Proceedings (Eastern).

Winsberg, Shirley, Wellesley College, Wellesley, Mass. "A Survey of Swimming for Women at the College Level—Current Trends in Enrollment, Requirements, Teaching Method, and Related Administrative Procedures."

ATHLETICS

Belding, Alice, Woman's College, Lynchburg, Va. "Athletics at Randolph-Macon College." Ref.: Conferences Proceedings (Eastern).

Eberhardt, Marjorie M., Wellesley College, Wellesley, Mass. "Standards in Athletics for High School Girls—A Comparison of Standards Endorsed by Teachers and of Those Actually Employed in Programs Under their Direction."

Gates, Edith, "Community Athletics for Girls and Women."

Lowrie, Kathleen, College of Wooster, Wooster, Ohio. "Study of Participation of Women as Playing Members of Men's Inter-Collegiate Teams." Ref.: Report of National Assn. of Directors of Physical Education for College Women, 1939.

McCall, Margaret, Alabama College, Montevallo, Ala. "Study of Soccer." Ref.: Study, 1939.

N.A.A.F., "A Study of Participation of Women in Olympic Games." Ref.: N.A.A.F. Study, 1937.

Riegel, Zella E., Texas Tech., Lubbock, Texas. "Wicket Ball." Ref.: To be published in the Soccer Handbook, 1939.

Sinclair, Caroline, State Teachers College, Fredericksburg, Va. "Girls Athletics in the High Schools of Va." Ref.: Results available.

ATTITUDES

Brockway, Charlotte, U.C.L.A., Los Angeles, Calif. "The Appreciation of P.E. of College Women as Measured by an Attitude Scale." Ref.: Master's Thesis, 1939.

Butsch, Margaret L., Wellesley College, Wellesley, Mass. "Further Studies in Student Interests and Attitudes concerning Physical Education Activities at Wellesley College."

Gilliland, Ellen, U.C.L.A., Los Angeles, Calif. "Measurement of Appreciation of P.E. in Senior and Junior High School Girls." Ref.: Master's Thesis, 1939.

Hazelton, Helen, and Piper, Junerose, Purdue University, LaFayette, Indiana. "A Study of Attitudes of College Freshmen Women to the Fall Physical Education Program: One Team Game and Two Individual Sports." Ref.: Study, 1939.

Post, Julia H., Winthrop College, Rock Hill, South Carolina. "Survey of Student Attitudes Relating to P.E. and Reaction to Reduction of Requirement." Ref.: Study, 1939.

Potts, Grace Mahleal, Texas State College for Women, Denton. "A Comparison of the Health Attitudes of Eighth Grade Boys and Girls." Ref.: Master's Thesis, June 1939.

Sauzle, Mrs. Catherine, Purdue University, Lafayette, Indiana. "Attitudes of Purdue Undergraduates Women to the Requirement."

Slimmer, Louis F., University of Wisconsin, Madison. "The Attitudes of High School Boys Toward Physical Education."

BODY MECHANICS

Bass, Ruth I., University of Iowa, Iowa City. "A Study of the Mechanics of Graceful Walking." Ref.: RES. QUART. 8:2 (May 1937) 173.

Bigelow, Mary Dixey, Wellesley College, Wellesley, Mass. "A Study of the Bony Variations and Interrelations of the Last Lumbar Vertebra and Sacrum."

Feliz, Inez, University of California, Berkeley. "A Study of the Range of Motion in the Lumbar and Pelvic Segments in Relation to Standing Posture." Ref.: Master's Thesis, May 1939.

Petts, S., Bryn Mawr College, Bryn Mawr, Pa. "Fundamental Principles of Good Movement." Ref.: Study in progress.

CAMPING

Bell, Jean, Indiana University, Bloomington, Indiana. "Camp Counselor Training." Ref.: Study in progress.

Bell, Jean, Indiana University, Bloomington. "Camp Counselors Training Course Outline." Ref.: Study, 1939.

Capps, Ethel, University of Michigan, Ann Arbor. "A Descriptive Study of Four N.Y.A. Educational Camps for Unemployed Women." Ref.: Thesis, August 1937.

CHARACTERISTICS OF PHYSICAL EDUCATION TEACHERS

Burnside, Mrs. Billie Burke Mitchell, University of Texas, Austin. "A Study of the Teaching Success of Women Graduates in Physical Education." Ref.: Master's Thesis, 1937.

Dickey, Martha Brooks, University of Texas, Austin. 'University Achievement and Teaching Success in Health and Physical Education." Ref.: Master's Thesis, August 1939.

Gormley, Helen, University of Wisconsin, Madison. "A Study of Factors which Influence the Success of Women Majors in Physical Education." Ref.: Thesis, 1937.

Kane, Isabel B., University of California, Berkeley. "A Study of Certain Factors Which Have Influenced the Election of Physical Education by Women at the University of California." Ref.: Master's Thesis, December 1937.

McClung, Anna Madge, West Virginia University, Morgantown. "A Personnel Study of Women Physical Education Teachers in Senior High Schools in West Virginia." Ref.: Master's Thesis, 1938.

CLASSIFICATION

Glassow, Ruth B., University of Wisconsin, Madison. "A Study of the Need for Classification for Physical Education Activities."

CORRECTIVES

Cochran, Helen; Sibley, Katherine, Syracuse, New York. "Enlarged Thyroid with Suggestions as to Appropriate Exercises to be Used in Such Cases." Ref.: Conference Proceedings (Eastern).

Fristoe, Margaretta B., Western College, Oxford, Ohio "Study of Mentrual Period Characteristics Relative to Abdominal Muscle Strength." Ref.: Master's Thesis.

Mensendieck, Dr. Bess, Mensendieck School, New York City. "The Mensendieck System of Functional Exercises." Ref.: Conference Proceedings (Eastern).

Rea, Dr. Marion, University of Pennsylvania, Philadelphia. "The Student with Menstrual Difficulties." Ref.: Conference Proceedings (Eastern).

Stone, Elizabeth, "The Effect of Teaching Gymnastics During the Menstrual Period." Ref.: Conference Proceedings (Eastern).

Waier, Elsie M., University of Michigan, Ann Arbor. "Menstrual History Study of the University High School Girls of Ann Arbor, Michigan." Ref.: Thesis, August 1938.

Wright, Elizabeth, Radcliffe College, Cambridge, Mass. "Exercise as a Factor in the Relief of Menstrual Disturbances." Ref.: Conference Proceedings (Eastern).

CURRICULUM

Cummings, Eleanor S., University of Vermont, Burlington. "Report on Experiment on a Freshman Program at University of Vermont." Ref.: Conference Proceedings (Eastern).

Graichen, Charlotte, University of Iowa, Iowa City. "A Seasonal Program of Physical Education Activities for Girls in the Small High Schools of North Dakota." Ref.: Master's Thesis, 1938.

Haddock, Frances Corrine, Wellesley College, Wellesley, Mass. "A Study of the Program of Physical Education for Women in Class A Accredited Negro Colleges."

Pryor, Helen B., Stanford University, Palo Alto, Calif. "Constitutional Studies as a Basis for Fitting the Physical Education Program to the Individual."

Rugen, Dr. Mable, University of Michigan, Ann Arbor. "A Field Research of Health and Physical Education Activities in So-Called Progressive Schools."

Schulmeyer, Louise M., Butler University, Indianapolis, Indiana. "Four-Year Curriculum on Physical Education for Women Major Students."

Swedberg, A. V., Augustana College, Rock Island, Ill. "Curriculum Studies."

DANCE

Andrews, Willie Dean, Georgia State College for Women, Milledgeville. "Problems in Methods of Teaching Social Dancing—Survey, Year 1938–1939." Ref.: Study, 1939.

Bloomer, Ruth, University of Michigan, Ann Arbor. "Background, Method, and Materials for Teaching the Dance."

Bloomer, Ruth, University of Michigan, Ann Arbor. "Dance Bibliography."

Boone, Mary Katherine, Texas State College for Women, Denton. "An Honor Course in History and Philosophy of the Dance." Ref.: Master's Thesis, August 1939.

Bowles, Luellen, State University of Iowa, Iowa City. "A Unit in Developing a Basis for Appreciation and Understanding of Modern Dance Through the Use of Films and Discussions." Ref.: Thesis, 1938.

Bryan, Marian K., Sarah Lawrence College, New York City. "Documentary Moving Picture of Dance. Martha Graham and Her Group Taken to Start Such Studies."

Dodson, Thelma, State University of Iowa, Iowa City. "Suite of Original Dance Compositions." Ref.: Thesis, 1938.

Dodson, Thelma, Northeast Missouri State Teachers College, Kirksville. "Dance Suite—Midwestern Suite." Ref.: Study in progress, 1939.

Dyke, Jennie, Wellesley College, Wellesley, Mass. "Dance Notation: A Comparative Analysis and Evaluation of Various Systems." Ref.: Master's Thesis, 1939.

Gregory, Helen, University of Oklahoma, Norman. "History of the Dance." Ref.: Not ready for publication.

Howard, Esther, Eastern Normal School, Madison, South Dakota. "The Place of the Dance in Pageants and Festivals." Ref.: Study in progress.

Jack, Florence, Jackson Junior College, Jackson, Mich. "A Survey of Dance Symposia." Ref.: Master's Thesis, 1939, N.Y.U.

Lucas, Marjorie, U.S.C., Los Angeles, Calif. "Dance for Men." Ref.: Study in progress, 1939.

Neyland, Roberta, University of Texas, Austin. "A Classification of Musical Accompaniment for Modern Dance." Ref.: Master's Thesis, 1939.

Olsen, Thelma, University of California, Berkeley. "A Kinesiological Analysis of Selected Dance Movements." Ref.: Master's Thesis, Dec. 1937.

Parrish, Elizabeth, University of California, Berkeley. "A Study of the Modern Dance in the Cultural Setting in the United States." Ref.: Thesis.

Peaseley, Virginia, University of Michigan, Ann Arbor. "A Graded List of Folk Dances." Ref.: Thesis.

Rathburn, Lois, Smith College, Northampton, Mass. "The Dalcroze Theory of Eurythmics in Education." Ref.: Thesis, 1938.

Ryan, Grace, Central State Teachers College, Mt. Pleasant, Mich. "Dances of Our Pioneers." Ref.: Published by A. S. Barnes, 1939.

Schwartz, Edith, Wellesley College, Wellesley, Mass. "An Evaluation of the Modern Dance with Respect to Certain Physical Objectives of Physical Education." Ref.: Master's Thesis, 1939.

Scott, Sarah Farrell, University of California, Berkeley. "A Study of Selected European Dance Forms and their Related Musical Forms, from the Sixteenth Century."

Stookey, Margaret M., Lindenwood College, St. Charles, Mo. "Croatian Dance in Europe." Ref.: Study in progress.

Stookey, Margaret M., Lindenwood College, St. Charles, Mo. "Detailed Account of the Schools of the Dance that Have 'Disappeared' in Austria since Hitler's Regime." Ref.: Study in progress, 1939.

Stookey, Margaret M., Lindenwood College, St. Charles, Mo. "Ancient Trembling Dances of Treborjevo (Croatian), in Jugoslavia." Ref.: Study in progress, 1939.

Triplett, May Evelyn, Texas State College for Women, Denton. "A Study of Beginning Tap Dancing with Reference to Certain Related Factors." Ref.: Master's Thesis, June 1939.

Triplett, Evelyn, Texas State College for Women, Denton. "A Study of 150 College Women Enrolled in Beginning Tap Dancing Classes with References to Certain Factors Related to This Skill." Ref.: Master's Thesis, 1939 (unpublished).

Triplett, Evelyn, Texas State College For Women, Denton. "A Comparative Study of Motor Ability, Rhythm, Skill, Information and Intelligence of College Women Enrolled in Beginning Tap Dancing Classes at Texas State College for Women." Ref.: (To be completed in the near future).

Troester, Katherine, State University of Iowa, Iowa City. "Comparisons of Forms in Dance and Music." Ref.: Thesis, 1938.

ELECTIVE PROGRAM

Kane, Isabell B., University of California, Berkeley. "A Study of Factors Influencing Participation of College Women in an Elective Program of Physical Education." Ref.: RES. QUART. 10:1 (March 1939) 57–66.

EXTRACURRICULAR

Canfield, Ellen, Cornell University, Ithaca, N.Y. "The Relation of the Athletic Association to the Department of Physical Education." Ref.: Not in print.

Curtis, Florence M., State Teachers College, Terre Haute, Ind. "A Survey of Extra-curricular Activities on our Campus and the Extent to which College Students Participate in Such Activities."

Douglass, Lucille, Texas State Teachers College for Women, Denton. "Critical Analysis of Athletic Activities for Girls in the University Interscholastic League of Texas." Ref.: Thesis, 1939.

Manchester, Gertrude, Milledgeville, Ga. "Determining Allotments for the Support of W.A.A." Ref.: Study in progress.

Teer, Kaw Waweechie, University of Texas, Austin. "An Evaluation of the High School Pep Squads in Texas." Ref.: Master's Thesis, 1939.

FEET

Bass, Ruth I., University of Texas, Austin. "Skeletal Proportions in Strong and Weak Feet." Ref.: Unpub. Research Section report; San Francisco, April 1939. Available.

Bass, Ruth, University of Texas, Austin. "Skeletal Proportions in Strong and Weak Feet." Ref.: Reported at Research Section, National Convention, April, 1939.

Gale, Mary A., University of Wisconsin, Madison. "Study of the Correlation of the Strength of the Foot with the Height of the Arch."

Grow, Judith, State University of Iowa, Iowa City. "A Study of the Vertical Jump as a Measure of Foot Function." Ref.: Thesis, 1938.

Hickman, Beatrice M., University of Texas, Austin. "Some of the Skeletal Characteristics of the Human Foot with Reference to Foot Strength." Ref.: Master's Thesis, 1939.

Kelly, Ellen, University of Oklahoma, Norman. "Dynamic Aspect of Foot Postures During Walking." Ref.: RES. QUART. 8:2 (May 1937).

Norris, L. Maude, University of Iowa, Iowa City. "An Investigation of an Evolutionary Theory of Individual Differences in the Correlated Structure and Function of the Human Foot."

Robinson, Marion, State University of Iowa, Iowa City. "A Study of Effects of Hard Usage Upon the Feet of College Women." Ref.: Thesis, 1938.

GAMES

Drom, Beulah J., University of Iowa, Iowa City. "A Study of the Play Interests of Elementary School Children in Relation to the Physical Education Program." Ref.: Study is completed.

Hale, Louise Kent, University of Iowa, Iowa City. "Construction of Reading Material in Games by Children of Grades III and IV."

N.A.A.F., "A Study of Participation of Women in Olympic Games." Ref.: N.A.A.F. Study, 1937.

GIRL SCOUTS

Phillips, Irmabelle, University of Texas, Austin. "A Comparison of Girl Scouts and Non-Scouts in Austin." Ref.: Master's Thesis, 1937.

GRADING

Hastie, Elizabeth, Adelphi College, Garden City, N.Y. "Grading in Physical Education for College Women." Ref.: Conference Proceedings (Eastern).

Schnieders, Sister H. Xaverius, University of Texas, Austin. "Markings in Physical Education for High School Girls." Ref.: Master's Thesis, 1938.

HEALTH AND ACCIDENTS

Adams, Catherine, University of Michigan, Ann Arbor. "An Analysis of Health Experiences on the Secondary School Level." Ref.: Thesis, June 1939.

Clark, Edith M., Los Angeles City College, Los Angeles, Calif. "A Syllabus of Authentic References Answering Questions Most Frequently Asked by Students in Health Education Classes." Ref.: Study, 1939.

Couch, Frances, University of Texas, Austin. "A Study of the Health Education Program and Facilities and Equipment for the Physical Education Program for Women Relative to a Sampling of Southern Colleges."

Cox, Helen W., University of Southern California, Glendale. "A Study of the Health Knowledge of Women Students at the Glendale Junior College. Ref.: Thesis, 1937.

Duncan, Mrs. Gertrude I., Temple University, Philadelphia, Pa. "Hygiene with Benefit and Pleasure—Article on New 'Lab' Course in Hygiene." Ref.: Study in progress, 1939.

Evans, Jeanette, University of Michigan, Ann Arbor. "A Survey of Health Education in Elementary Schools of Michigan." Ref.: Thesis, June 1939.

Evans, Lorin, University of Wisconsin, Madison. "Common Ailments in High School Pupils."

Finlayson, Anne, University of Michigan, Ann Arbor. "An Analysis of the Health Record Cards of the Kalamazoo (Michigan) Public Schools." Ref.: Thesis, 1938.

Garbett, Elizabeth, George Washington University, Washington, D.C. "A Study of Traffic Accidents to Children Sixteen Years of Age and Under, Washington, D.C., Sept. 1935–1937." Ref.: Master's Thesis, 1939.

Holliday, Rowena Berynee, University of Texas, Austin. "Health Information and Interests of High School Girls." Ref.: Master's Thesis, 1937.

Kelly, Ellen, University of Oklahoma, Norman. "Statistical Survey of a Comparison Between the Health Rating and Scholastic Rating Between the Working and Non-Working Students in the University of Oklahoma." Ref.: Study in progress.

Kelly, Ellen, University of Oklahoma, Norman. "Statistical Analysis of Errors in Hygiene Examinations in Use in Department of Physical Education for Women, University of Oklahoma." Ref.: Ready for publication.

Ligon, Delma Lee, University of Texas, Austin. "Health and Physical Education for Men in Texas Junior Colleges." Ref.: Master's Thesis, 1938.

Lowrie, Kathleen, College of Wooster, Wooster, Ohio. "Health Coordination in Ohio Colleges."

Simond, Gladys, University of Michigan, Ann Arbor. "A Program in Safety and Health Education." Ref.: Thesis, August 1939.

Smith, Fredrika, Smith College, Northampton, Mass. "Variations in Physical Fitness of Smith College Students at Different Periods in the College Year." Ref.: B.A., 1938, Wilson College.

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BOOK REVIEWS

THE DEVELOPMENT OF EDUCATION IN THE TWENTIETH CENTURY. Adolph E. Meyer, Ph.D. (New York: Prentice-Hall, Inc., 1939) 402 pages, $2.75.

Dr. E. George Payne, Dean of the School of Education at New York University, himself a well-known educational sociologist, says in the introduction of this new treatise on contemporary and comparative education:

"For two decades the whole attention of education was centered upon the scientific study of learning, method, and measurement of a conventional school program, and the social significance of education was almost forgotten. More recently there has been a strong reaction to the extreme and limited scientific emphasis in the sociological studies and progressive educational movements which tends to balance the whole educational program.

The story of this period is a fascinating one and is here presented comprehensively for the first time by an exacting scholar. This book, therefore, represents a significant contribution which will be welcomed by every educator."

To the educator interested in the sociological and historical backgrounds and bases for present-day educational systems in both North America and Europe, the perusal of this text is a distinct pleasure. Dr. Meyer concedes that his efforts are "intended principally as a teaching instrument to enable teachers and prospective teachers to have in a single volume a bird's-eye glimpse of the recent educational past." As the title implies, the book is a resume of the growth of twentieth-century education. Earlier education in Europe and America is considered only as it may be fundamental to present-day characteristics and features.

Nearly a third of the total material considered is a detailed and expository portrayal of progressive education in most of its ramifications. Historical influences and the individualistic motives of Rousseau, Pestallozzi, and Felix Adler receive first consideration. Next the modernizing educational theories of John Dewey, G. Stanley Hall, William H. Kilpatrick, and Hughes Mearns are treated from the point of view of their influences on the contemporary progressive education movement in the United States. Among the native Europeans having to do with the remaking of education abroad, those dwelt upon are: Maria Montessori, Ovide Decroly, Roger Cousinet, Berthold Otto, Stanislas Shatsky, and Bertrand Russell, who is having his innings with certain ecclesiastical New York personages as this review is being composed. After a summarization of the distinctive features of the more notable experimental schools, Dr. Meyer proceeds to record pro and con comments of progressive education in general. New York University's idealist Dr. H. H. Horne is quoted as saying the new education "is an educational philosophy that is improving schoolroom practice, making learning a more purposeful process, giving children the sense of reality in the school, making schools into workshops, laboratories and libraries, and inspiring educational experimentation." President Nicholas Murray Butler, of Columbia University, and Dr. William C. Bagley, of Columbia's Teachers College, are cited as being critical, along with their reasons why. Our author, in the meantime, appears to be objective and follows a middle-of-the-road course. In his efforts

to present both sides of the question Dr. Meyer perhaps leans over backwards and unconsciously gives the palm to the newer sociological emphasis.

Approximately a fourth of the subject matter included has to do with what the author has chosen to label "Other Developments." Such emphases as the scientific, psychological, and individualizing approaches are well elaborated upon, as are adult education, the platoon school, and newer methods in college and university teaching. Even though they may not be specifically labeled as such, in all the divisions so elaborated upon the underlying sociological and economic foundations are resident, as well as the resultant educational theories.

In the opinion of this reviewer, it is in the third subject matter division, or what amounts to almost the latter half of this text, that Dr. Meyer has made his most outstanding and revealing contribution. Five leading European and our own national systems of education receive careful and precise development at the hands of this promising writer. The fact that he resided and studied in both Europe and the United States is undoubtedly the reason for his minute criticism of the advantages or disadvantages of each feature of the various national educational systems. His illuminating word picture of French education and his near-scathing comments on indoctrination and regimentation in present-day Nazi Germany's educational scheme remain in the reader's mind for some time after reading.

In fairness to all concerned, it must be added that quotations from primary and secondary sources, as well as established sociological, economic, and political facts are included and utilized as premises for constructive or derogatory criticism or comments, as the case may be.

The usual selected references and a rather unique appendix of sociological and factual questions act as prompting materials for further investigation and better comprehension.

The format of the book itself and the pungent expressions included therein combine to make this publication a singular illumination in an educational fog that too long has beclouded contemporary educational sociology and its academically related fields.

To every educator, be he a Progressive (note the capital P), physical educator, or plain professional pedagogue, who has at some time attempted to comprehend better the whys and wherefores of various educational programs in Europe and America, this endeavor is recommended. Although it is not especially dedicated to these purposes, this book should help the reader to understand, compare, learn, sympathize, and criticize so as to improve and enhance his own teaching.

PAUL R. WASHKE
University of Oregon

INTRAMURAL SPORTS. Elmer D. Mitchell. (New York: A. S. Barnes and Co., 1939) 324 pages, $2.00.

The original edition of this book was published in 1925. For fourteen years it has been recognized as the standard work on this subject. During these years great advances have been made in this field and intramural sports have become a well-established part of our educational system. No physical education and athletic department is complete today unless it includes a comprehensive intramural program.

Mr. Mitchell, with his wealth of experience in this and all related fields, has entirely rewritten the book to bring the developments up to date and include the contributions of such groups as the Western Conference, the College Directors' Society, the A.A.H.P.E.R., and all the various women's organizations. The more recent trends in intramurals are discussed.

Chapters 5, 6, 9, and 14 are entirely new and include reproductions of forms, programs, and materials that have been used in different schools throughout the country. The book is full of practical suggestions that have been found to be successful in actual practice.

The Bibliography is also a new feature which adds greatly to the value of

the book. Some four hundred titles are listed in the Bibliography. When the original edition appeared, there were no books and only a few articles written on this subject.

In my judgment, this book is indispensable to anyone in the field of physical education and recreation, and meets the need for a comprehensive text and guide on intramural sports. It is one of the few books which I would recommend to be included in the library of every person in physical education.

The author has condensed in this book his experience of the past twenty-five years and his unique contributions to this field, in which he is recognized as a pioneer and authority.

J. H. Nichols, M.D.
Professor of Physical Education, Oberlin College

An Introduction to the Evaluation of Motion Pictures in General Education. Committee on Motion Pictures in Education, Ben G. Graham, Chairman. (Washington, D.C., Motion Picture Project, American Council on Education, 1939) 18 pages, mimeographed pamphlet, free.

In order to standardize and increase the effectiveness of preview and evaluation reports on motion pictures for classroom use, this booklet was specifically prepared for distribution to teachers cooperating in the study being carried on by the Motion Picture Project. However, it contains many suggestions which might prove helpful to local film centers, or schools that are using motion pictures in the curriculum.

The first section is in the form of a preview manual which outlines the standard procedure for previewing new films, and, as conceived, is divided into three parts: the film reference, the description, and the appraisal. Each of these subdivisions is explained in detail, and practical outlines for writing the preview are indicated.

The second section gives two sample preview write-ups as examples of correct procedure outlined in the first section.

The third section contains a sample preview, and is followed by an example of classroom evaluation of the film previewed. This last section is in the preliminary stage, but serves to indicate the type of treatment planned by the committee to summarize the results of evaluation by cooperating classes in the field.

The pamphlet should prove very helpful to all teachers using motion pictures in physical education, as well as in general education, and to local film centers and school film libraries which might facilitate the use of films by presenting information on available motion pictures in the suggested complete and thorough style.

Elaine M. Dear
Monticello College, Godfrey, Illinois;
Motion Picture Committee, N.S.W.A.

From Head to Foot. Armitage Whitman, M.D. (New York: Farrar and Rinehart, Inc., 1939) 262 pages, $2.50.

"Posture," says Dr. Whitman, "is an attitude of body *and* of mind. A person who stands as if he felt well is more likely to feel well than one who stands as if he felt ill. The treatment of posture, therefore," he concludes, "begins in the head."

The body is likened to an accordion standing on end; an accordion filled with precious and perishable fruits. Stretched to its greatest length these fruits will not be damaged; contracted it will crush them. (A novel simile—not?) The author proceeds to point out one by one the internal organs and the role each plays in health and recreation. He shows how this role is interfered with by incorrect posture—for example, how that prevalent disorder, constipation, is found where abdominal muscles are too lax and how an exaggerated inward spinal curve may cause congestion of the kidneys. He advocates scientific exercises under constant supervision and posture practice before mirrors. (He makes some amusing comments about "charm schools" suggesting that the best type of real charm is found in "an attitude

of unhurried, unruffled serenity" and he tells of some good ways to achieve this.)

Poor feet are poor posture's foundation. So nearly twenty pages are given over to foot health and foot troubles. A most lucid description of the foot's mechanism is given, as is also a word picture of the effect of foot troubles upon one's disposition. Clear, easy-to-follow instructions are given for overcoming these difficulties through corrective walking and proper balancing of the body.

The inadvisability of urging the use of the feet at too early an age is emphasized. The doctor remarks with pleasure upon the fact that "children nowadays are enjoying the benefits of expert training in all forms of sports." But some children are not taught how to stand and walk correctly. Tendency toward bow legs and knock-knees will keep a boy from becoming a successful athlete. Such tendencies should be watched for, discovered at the start, and corrected before it is too late. Not only because they are life-long handicaps in themselves but also because they so often pave the way for curvature of the spine, "a very common deformity" to be found to a greater or less degree in about one half of all school children today according to this orthopedic surgeon. (Diseases of the nervous system, rickets, and wryneck are listed as some of the most common causes.) It occurs most frequently during the years from twelve to sixteen and more often in girls than boys. (This is not including cases which result from poliomyelitis.) Dr. Whitman would have children's bare backs more frequently examined.

A helpful chapter on infantile paralysis is followed by "Influences of a Handicap." Every teacher of health education should read and reread that. It contains valuable stories of actual handicapped students who rose above their disabilities, entered into school sports, and made their own places in the world. They are inspiring and very well told.

There is a common misconception on the part of the public concerning the word "fracture." Not everyone knows that a fractured bone is broken, Dr. Whitman points out. Then he goes on to tell how quickly to detect a fracture when a student has met with an accident and how to protect the child from further injuries due to incorrect handling. He also discusses different medical methods of cure tried out in America and abroad. The dangers of osteomyelitis — inflammation of the bone — are touched upon and the reader is told how it may be avoided.

Injuries to the joints occasionally occur during active participation in sports. A kick in the knee, a sudden twist of the knee-cap, or strain imposed upon a weak foot may be the direct cause. Strained ankles are suffered while "playing in the rough, contact games, like football." Dr. Whitman believes it is foolish to apply Epsom salts after swelling has appeared since with prompt and proper strapping there need be no swelling. Tennis players who have "bad ankles" are told how this condition may be corrected.

Dislocated shoulders should be treated with ultimate recovery in mind, not a permanent partial loss of use. Back strain, with pain, often follows an injury too as, for example, one received upon the football field by direct violence, or by indirect violence, such as follows the lifting of an unusually heavy weight. The treatment for this is discussed by the author, and a chapter is devoted to physiotherapy.

Dr. Whitman, the author, is Associate Professor of Orthopedics at Columbia University, in New York.

BEULAH FRANCE, R.N.
New York City